plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

MAY
1961

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The Relative Reactivity of Various Nickel Electrodeposits

Electroplating onto Zinc-Titanium-Copper Alloy

A Microscopic Examination of Nickel-Chromium Coatings After Atmospheric Corrosion

AES 48th Annual Convention Tentative Program

Abstracts of AES Convention Educational Program Papers

PLATING MAGAZINE

AMERICAN ELECTROPLATERS SOCIETY

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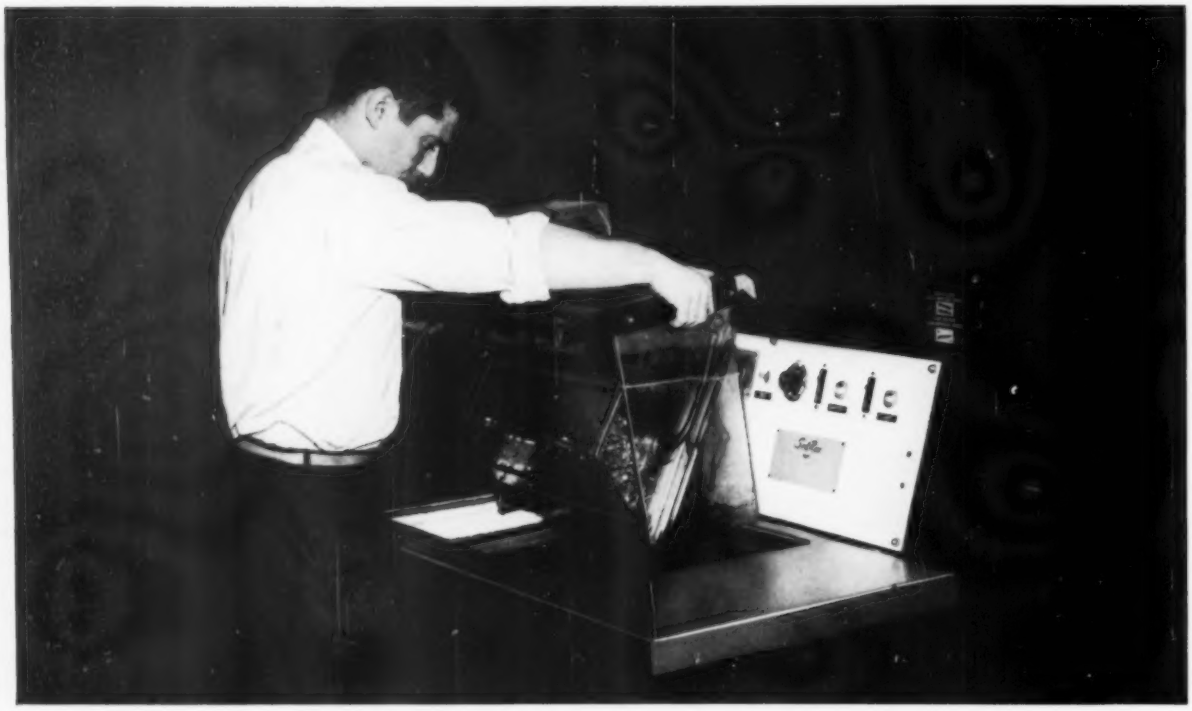

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Glass-Tite Industries Improves Transistor-Headers' Reliability with Autronex* Acid Gold Electroplate

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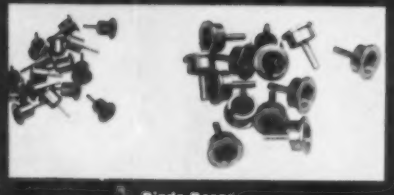
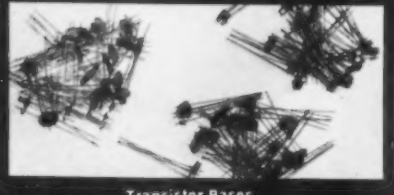


Diode Bases



Transistor Bases

Wrap transistor-header lead wires around a 40-thousandth mandrel—subject the headers to a scorching 400°C—dip them in a highly concentrated solution of hydrofluoric, nitric and acetic acids (CP-4) and you have some idea of what Autronex Acid Gold Electroplate withstands at Glass-Tite Industries, Inc. Providence, Rhode Island. Actually, all these "tests" are functional. The transistor headers will be subjected to similar conditions by military and industrial end-users while becoming critical components in complex electronic equipment.

According to Mr. John Newman, Chief Chemical Engineer at Glass-Tite, the Autronex Acid Gold Electroplating Process was installed because it demonstrated dramatic superiority over other materials. On one occasion, Mr. Newman relates, Autronex Gold Plated Transistor-Headers were left in the CP-4 etch solution *overnight*—". . . just to see what would happen." By morning, the glass seals had dissolved, the Autronex Gold Electroplate had not been affected.

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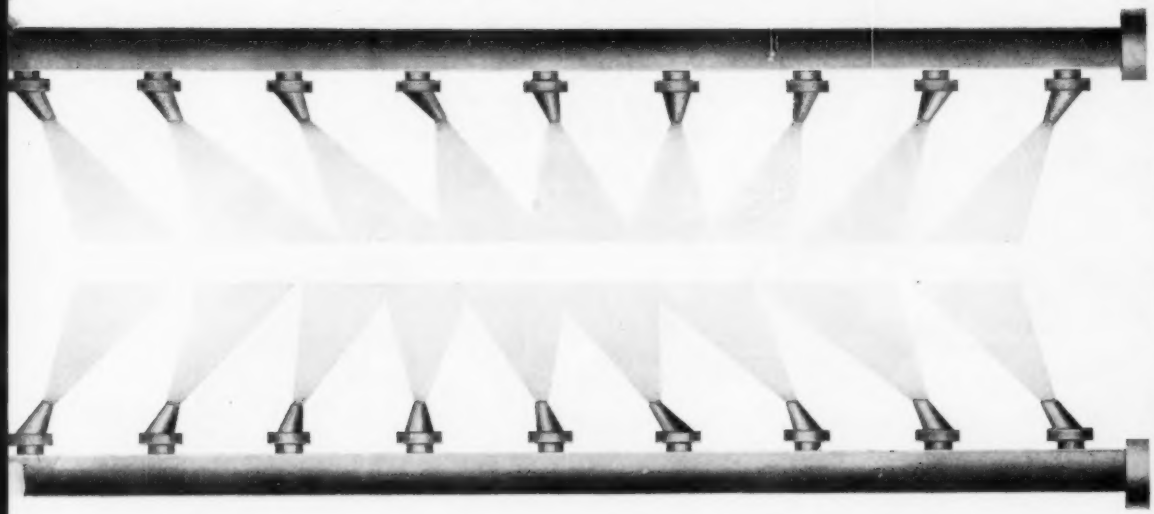

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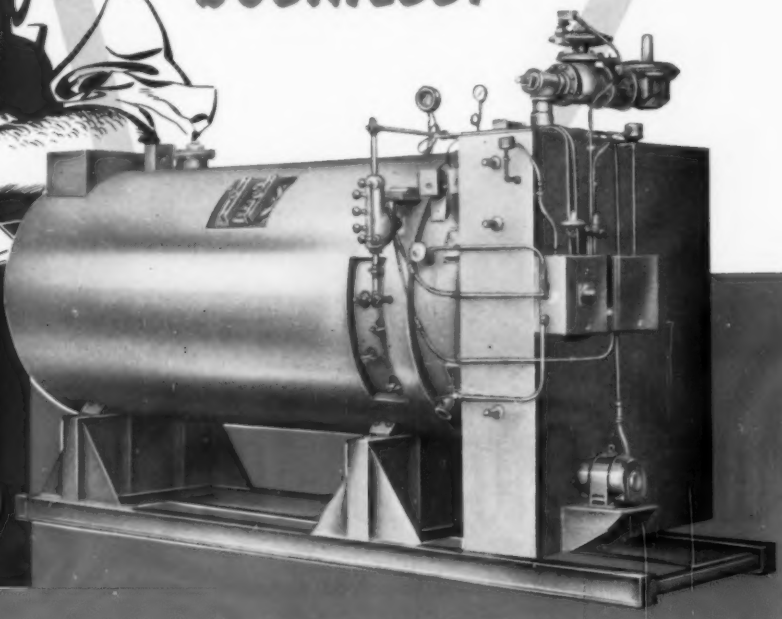

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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

PRE-CONVENTION ISSUE

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EDITORIAL

"BELONGING"

THE VERY CORE and foundation of the government of this great United States of ours is that it "Belongs" to us and we "Belong" to it—a true government "Of the People, By the People and For the People."

This sense of "Belonging" begins when a child is born into one of our American families. The love and care fostered upon a child by its parents help it develop a sense of security and the feeling that it "Belongs" to, and is a part of, the family. As the child matures, it returns that love by giving service to the family.

We, as adults, continue to look for security by "Belonging" to churches, social clubs, fraternal organizations, insurance groups and educational societies. In this way, we endeavor to satisfy our religious, social, material and mental needs both for the present and for the future.

The AES, through its Branch, Regional and National Meetings, its PLATING MAGAZINE and its TECHNICAL PROCEEDINGS, offers the opportunity of "Belonging" to a Society that will help in all but one of the above needs. Too many people are just joiners, never reaching the stage of "Belonging," and still more people feel that it is a waste of time to attend meetings.

Surely the tremendous contribution of the AES through its dissemination of knowledge and its research programs, to say nothing of the inestimable value of meeting and exchanging ideas with others in the industry, are "plus" values that no capable and responsible operator can afford to disregard.

Those who really "Belong" to the AES, look upon its program as an adjunct to their own business or an extra partner who helps them attain a justifiable feeling of security and satisfaction in the knowledge of work well-done.

To those of you who now have membership in the AES, the Society offers the opportunity of becoming a "Belonger" by participating wholeheartedly in its program.

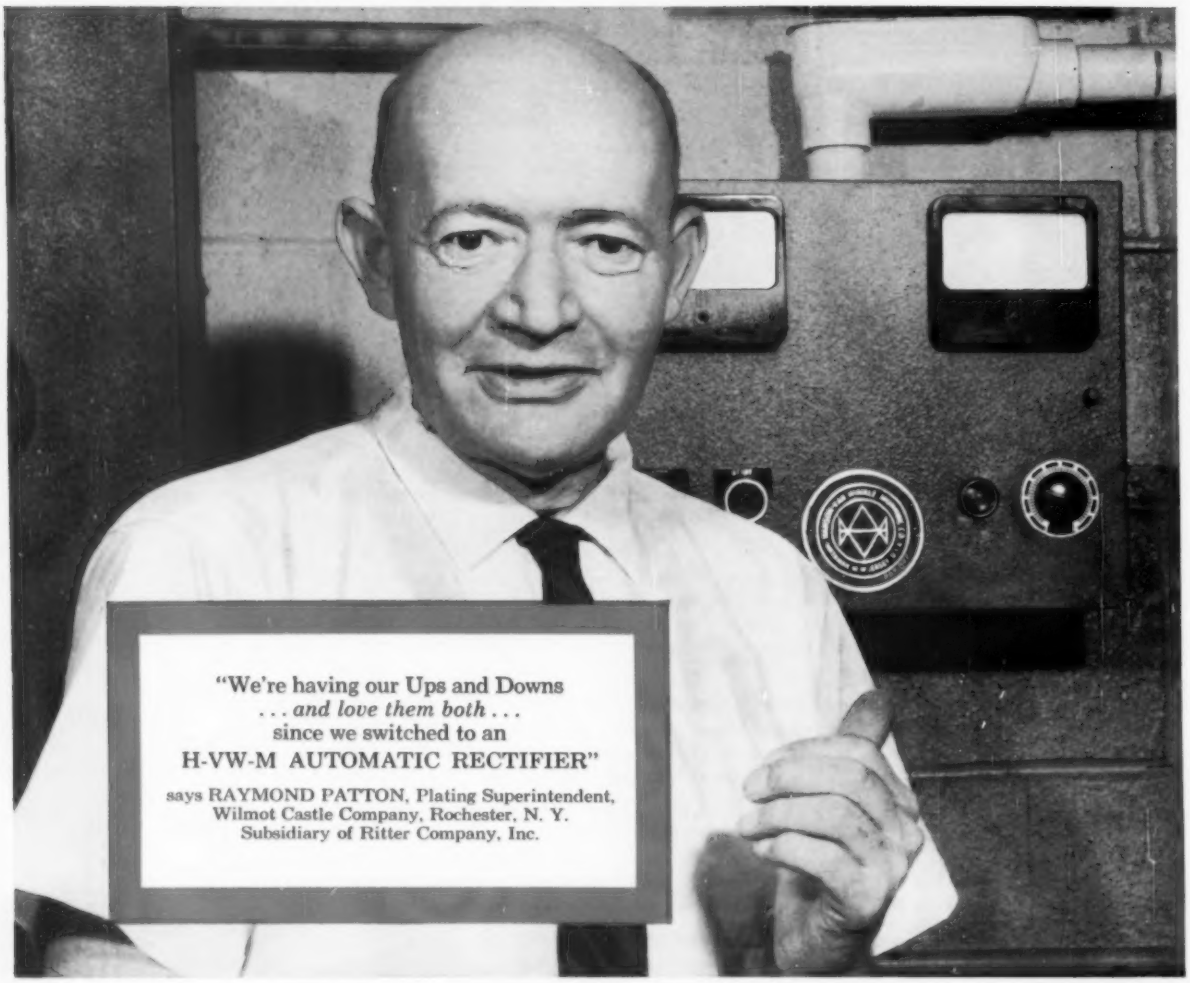
If you are not now a member, AES urges you to grasp the opportunity to improve yourself and promote your business.

You owe yourself the satisfaction of "Belonging"!

Ralph D. Wysong

Immediate Past President
American Electroplaters' Society, Inc.

PLATING MAGAZINE


"We're having our Ups and Downs
. . . and love them both . . .
since we switched to an
H-VW-M AUTOMATIC RECTIFIER"
says RAYMOND PATTON, Plating Superintendent,
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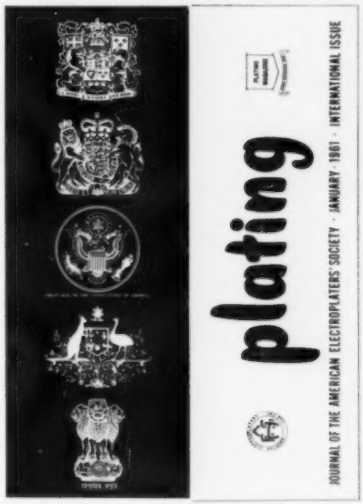

PROGRESSIVE industrial advertisers and their advertising agencies in today's buyers market are more than ever studiously selective in picking publications to convey their merchandising messages to market. Quality and prestige of publication—coverage of field—readership acceptance demonstrated by subscription renewal—advertising rates—supplementary services helpful to the advertiser—are among collective predicates widely motivating individual choice of media.

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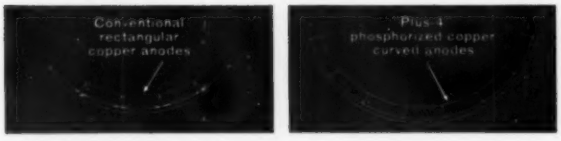

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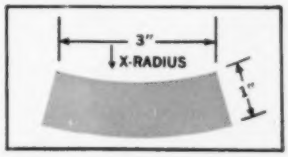

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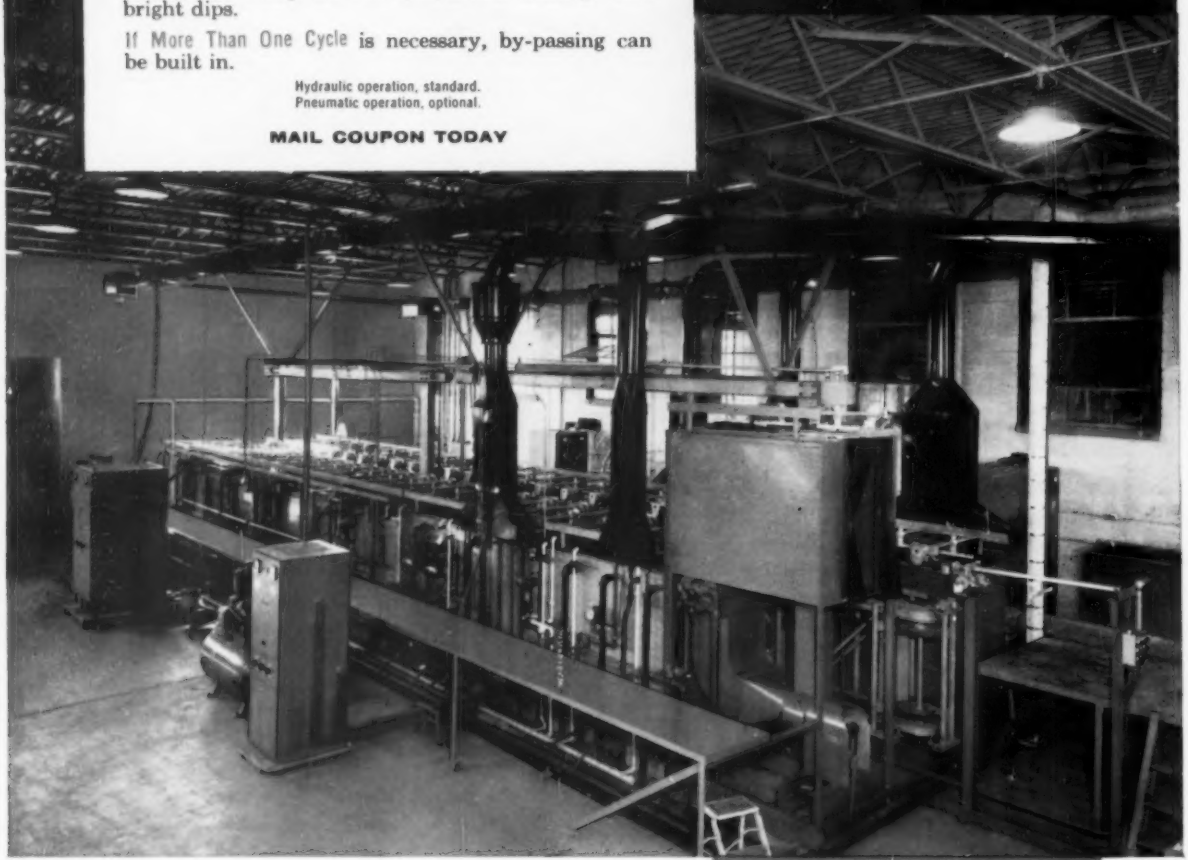

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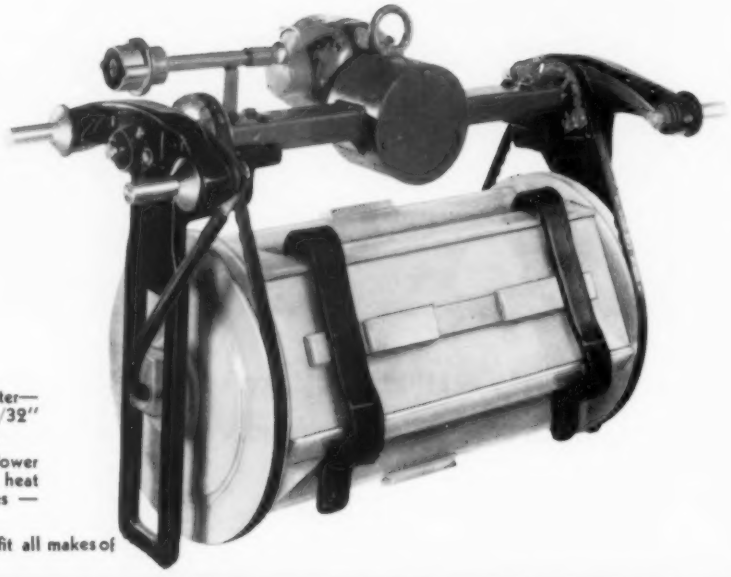

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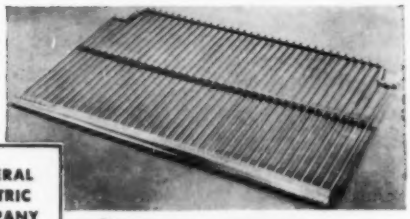

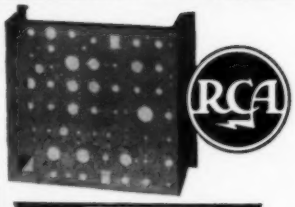

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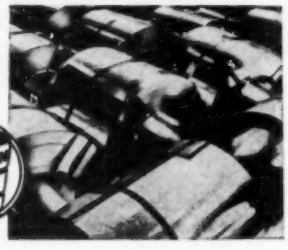

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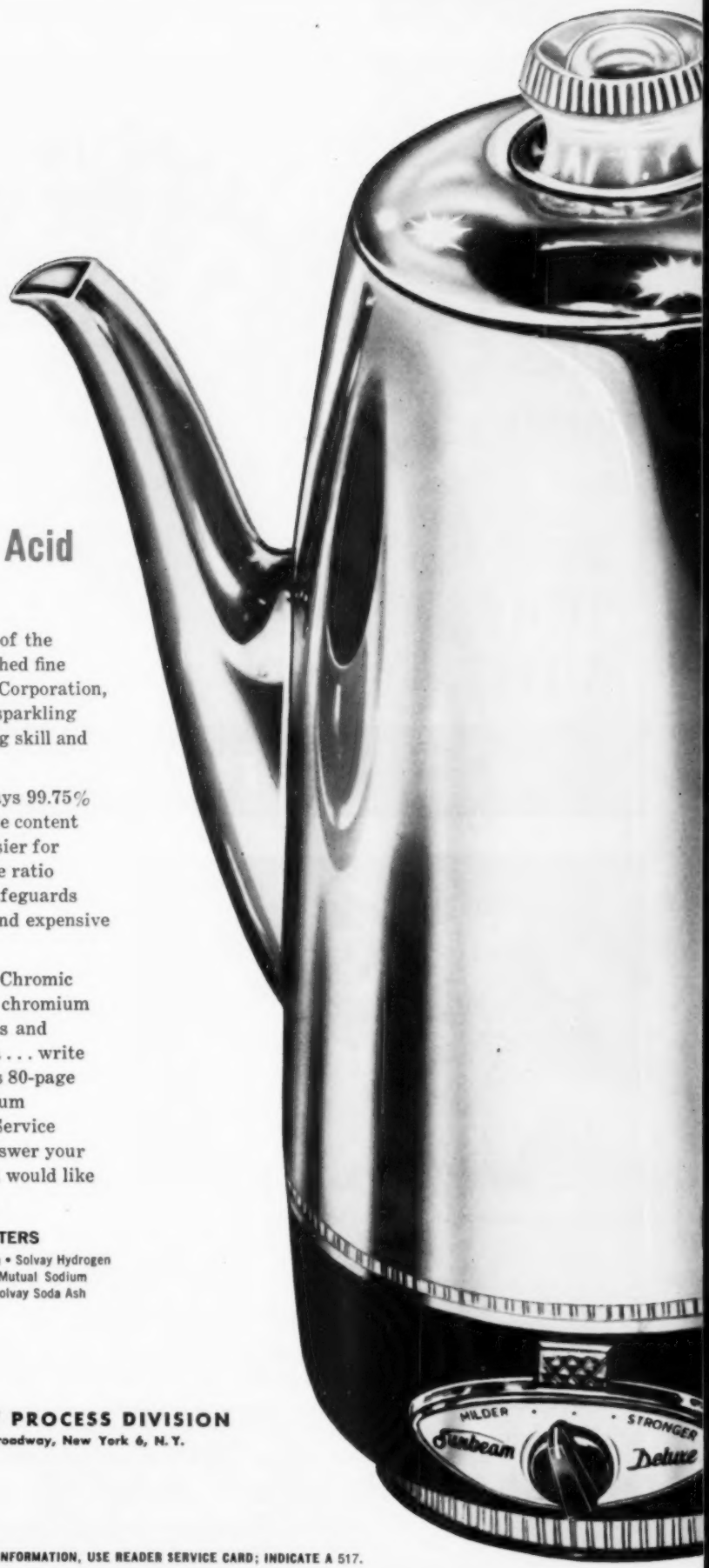

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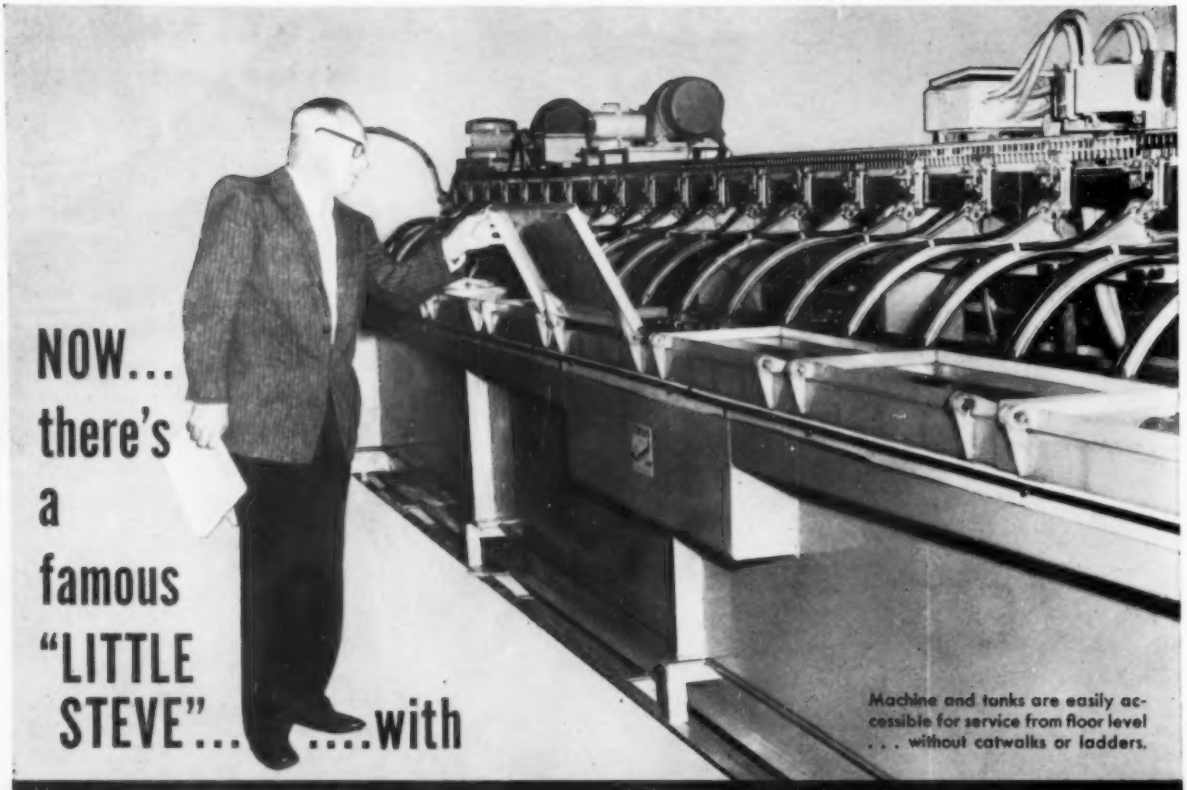
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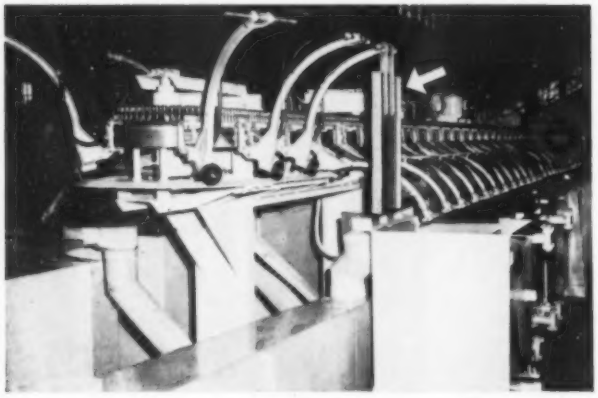

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THE INTERNATIONALLY awaited 1960 Edition of the annual book, TECHNICAL PROCEEDINGS, of American Electroplaters' Society, Inc. (AES), published in record time, has now made its appearance, and copies thereof have already been issued to AES members in good standing far and wide, here and abroad, for whom the annual book is principally intended. And having accommodated its farflung membership with free copies, AES, the book's exclusive publisher, now has a limited quantity of extra copies available for sale to AES non-members, on strictly a "first come-first served" basis so long as that limited supply lasts, so as to share the book's educational benefits.

Comparable in quality to the GOLDEN JUBILEE EDITION of TECHNICAL PROCEEDINGS (1959 Edition) that earned worldwide acclamation in technical, scientific and other educational circles, AES's 1960 Edition, another treasure chest of knowledge on electroplating, metal finishing, organic coating and allied arts, contains the full text of each of the 31 papers delivered by experts before the 47th Annual Convention of American Electroplaters' Society, Inc., held in Los Angeles, California, July 24-28, 1960.

Embodying, too, the charts, diagrams, graphs, tables and other illustrations of each of the 31 published papers, the book also includes the transcript of the discussion that attended the delivery of each paper. A full list of the papers published in this voluminous repository of education appears on the opposite page of this announcement.

The unique book also includes, among other data, a day-to-day log of the Convention; a section on the AES Scientific Achievement Award and on other AES technical and scientific awards and honors bestowed at that first West Coast National AES Convention; a full listing of the Boards and Standing and Special Committees that served the AES during its fifty-first year, and a complete AES Branch Directory.

HOW TO ORDER YOUR COPY

A limited but fast dwindling extra quantity of the 1960 book has, as stated, been printed to meet the sizable interest shown in it by AES non-members internationally. Orders for copies of the book are now consequently invited from AES non-members, and will be accepted on strictly a "first come-first served" basis so long as that extra supply lasts. The book is unavailable for purchase elsewhere.

Within the continental limits of the United States, the domestic price of this 1960 Edition of AES's TECHNICAL PROCEEDINGS is $18 per copy including postage.

To those ordering from outside the United States' continental limits, the charge is $22 per copy including postage.

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As a dramatic and fitting climax of its 51st fiscal year, American Electroplaters' Society, Inc. (AES) conducted its outstanding 47th Annual Convention, first West of St. Louis, at the Statler-Hilton Hotel, Los Angeles, California, July 24-28, 1960, with the dynamic Los Angeles Branch, its West Coast pioneer, as Host Branch.

♦

The AES was welcomed to California and Los Angeles by Governor Edmund G. Brown and by Mayor Norris Poulson. The entire week of the AES's Convention was, in fact, proclaimed by Los Angeles's Mayor as "American Electroplaters' Society Week in Los Angeles."

♦

Educational Sessions numbered nine. Experts presented 31 technical and scientific papers enriching knowledge in electroplating, metal finishing and allied arts. One Session alone covered organic finishing.

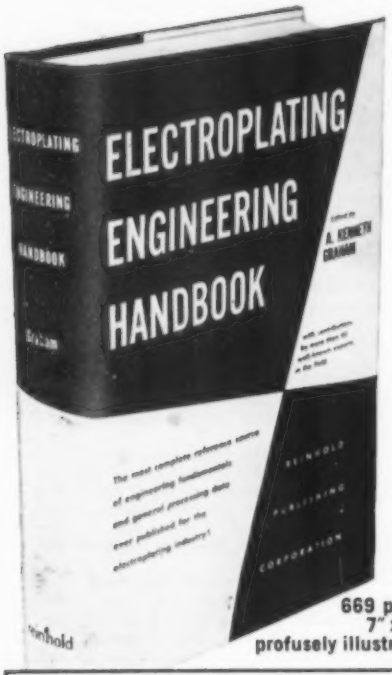
High spots of the Sessions were not only the second annual "William Blum Lecture" that was delivered as the Educational Program's lead-off attraction by Dr. A. Kenneth Graham, 1959 winner of the "AES Scientific Achievement Award", the Society's highest scientific honor, but also the vaunted two-session, eight-paper "Hydrogen Embrittlement in Metal Finishing Symposium." In addition, this Convention also featured the summary of AES Research Projects presented by AES Research Committee Chairman James D. Thomas at one of the Sessions.

♦

Under the active planning and supervision of the AES's Editorial Board itself, the Educational Sessions were programmed for the AES by Host Branch Educational Chairman Earl W. Arnold and his Co-Chairman, David F. Seymour, with Dr. Harold J. Read of Pennsylvania State University, a special member of that Los Angeles Branch Committee, responsible for the "Hydrogen Embrittlement in Metal Finishing Symposium."

OPENING EDUCATIONAL SESSION HEARS 1960 "WILLIAM BLUM LECTURE"

(1) Dr. William Blum introducing Dr. A. Kenneth Graham, deliverer of the 1960 "William Blum Lecture." (2) Attentive audience hears Dr. Graham discuss "Faraday's Laws Applied to Cleaning." (3) Dr. Graham holds "AES Scientific Achievement Award" scroll presented to him by National President Ralph D. Wysong, right, in behalf of American Electroplaters' Society, Inc.



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Here are a few excerpts from a review in *Research and Engineering:* "The book is very well written, remarkably free from typographical errors, and shows an excellent appreciation of the problems encountered by the practitioner in the selection of tables and topics covered . . . much attention is paid to definition of all terms used, and it appears that special attention must have been directed toward making each presentation easy to understand . . . The editor and his associates are to be complimented on a fine job, resulting in a volume which may be recommended to all who are associated with the engineering aspects of electroplating."

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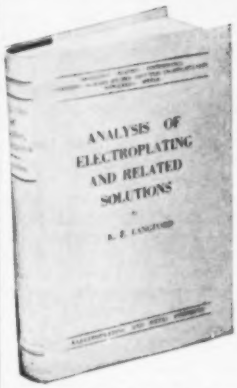

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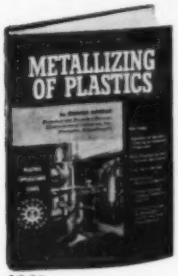

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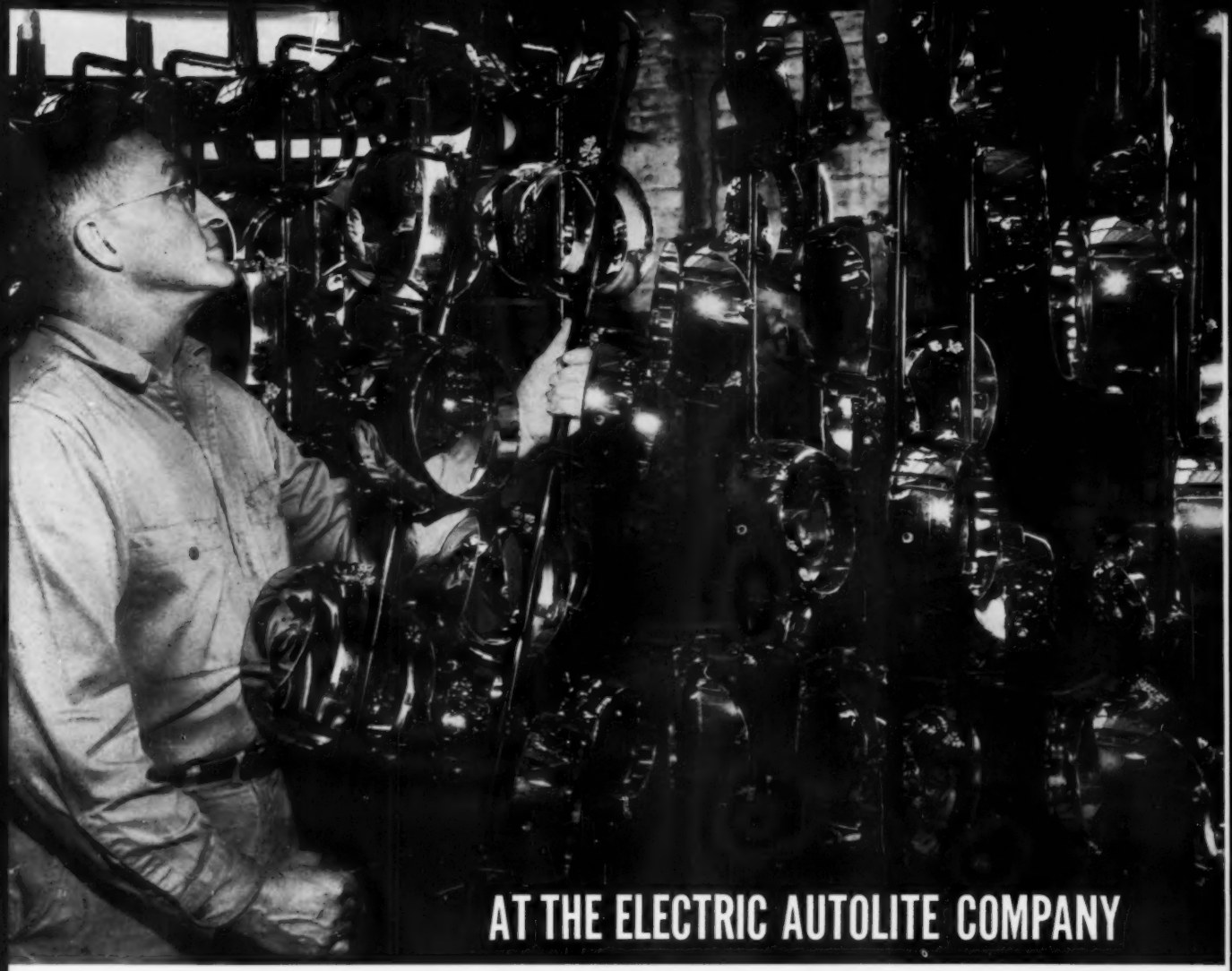

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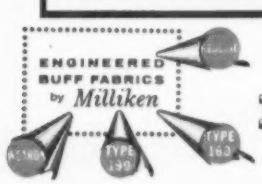

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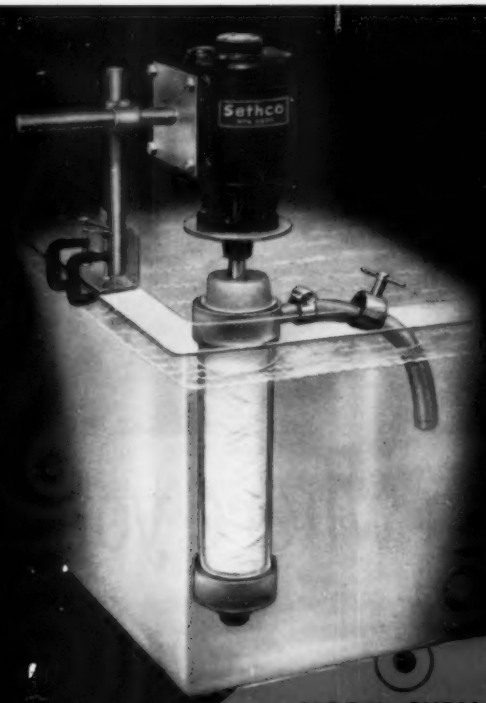

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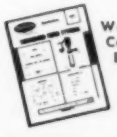

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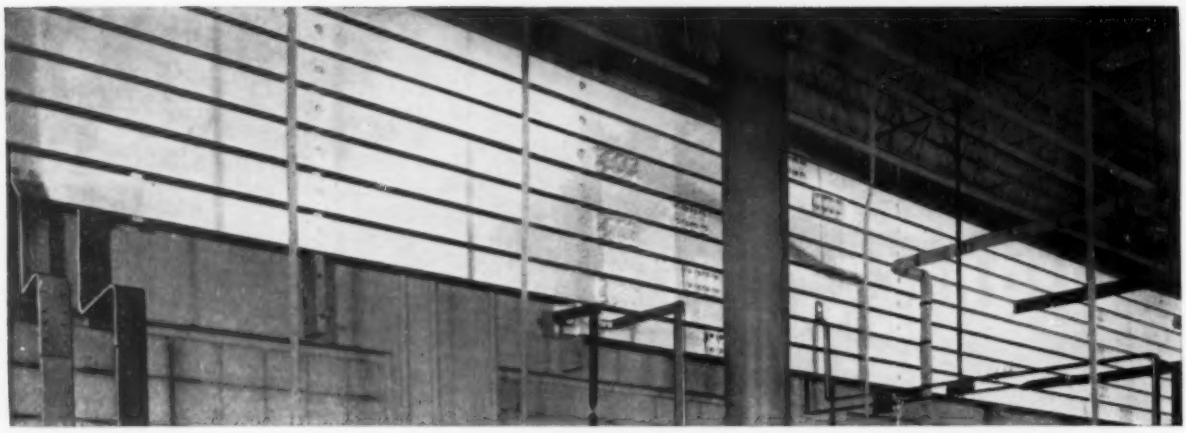

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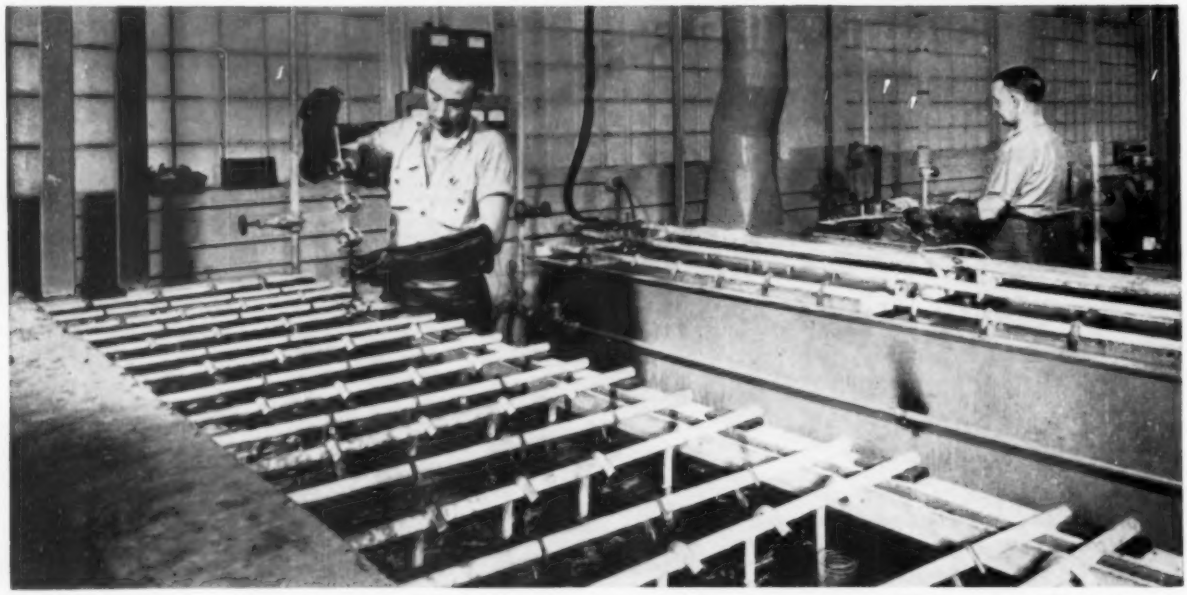

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THE RELATIVE REACTIVITY OF VARIOUS NICKEL ELECTRODEPOSITS

by V. HOSPADARUK and J. V. PETROCELLI*

ABSTRACT

The relative electrochemical reactivities of various nickel electrodeposits have been determined. Potentiostatic and galvanostatic techniques were used to determine the reactivities and relative pitting tendencies of Watts-type, semi-bright and bright nickel deposits. The reactivity and pitting tendency of nickel increase as the sulfur content increases. A sulfur-free bright deposit has a reactivity comparable to a Watts deposit. The electrochemical characteristics of the semi-bright and bright deposits explain the corrosion behavior of duplex-nickel coatings.

INTRODUCTION

THE IMPORTANCE OF ELECTRODEPOSITED nickel-chromium coatings in the plating industry is well known. Although the plated finish is chiefly used for decorative purposes, the corrosion resistance imparted to the final product is extremely important. Although there has been a considerable improvement in the durability of this decorative coating system in the last few years, studies of the literature on the performance show differences in conclusions.

The lack of agreement is not surprising when one considers the complexity and enormity of the many variables which are operative both in the service and atmospheric exposure conditions.[1, 2] There are a great many factors governing the performance in static exposures—marine, industrial, and rural—which are not fully understood. The vagaries of the weather are well known. Environments are not simply marine, industrial and rural. They may involve salts for de-icing and other unusual factors. It has been recently pointed out that continuous atmospheric exposure may not represent actual service conditions, especially for automobile hardware.[3]

Another obstacle to progress in the evaluation and improvement of decorative coatings has been the difficulty of devising accelerated test methods which will predict accurately the corrosion behavior to be expected in service. Although there is some evidence[3, 4, 5] that the Corrodkote test and the CASS test are proving useful, the translation and correlation of accelerated test results with service exposure still remains questionable.[6] As pointed out by LaQue,[1] it is possible that too much emphasis has been placed on the requirement that an accelerated test should simulate some selected natural environment.

At any rate, neither the accelerated tests now in use nor the static exposures yield information which may be used directly for determining the causes of failure or the mechanisms of corrosion. Although some electrochemical data has appeared recently,[7] a real need exists for more basic data on the corrosion characteristics and behavior of nickel and nickel-chromium electrodeposits. Such data should at least indicate what is required to improve the corrosion protective properties of these coatings. A rather comprehensive program for determining some pertinent electrochemical data is underway in this laboratory. The work reported here describes some of the results obtained on the determination of the relative electrochemical reactivity and pitting tendency of various nickel electrodeposits. Subsequent communications will deal with polarization and probable corrosion mechanisms.

Wesley and Knapp[8] have shown that it is not necessary to postulate the presence of initial porosity—pores formed during the plating process—in the nickel deposit to account for corrosion during weathering. Several other investigators have also indicated that the corrosion process is ultimately due to the corrosion of the nickel deposit. During exposure, the nickel may be subject to corrosion at "initial" discontinuities in the chromium and/or sites where the chromium has corroded away.[3, 9] Since pure nickel has a very low rate of corrosion in many atmospheres, the above realization was not disturbing; particularly when adequate thicknesses of deposit are applied.

There are indications, however, that some bright nickel deposits may be more reactive than the buffed dull nickel deposits. Early in 1938 Blum, et al showed that some bright nickels were inferior to dull nickel.[10]

Wesley and Knapp[8] reported that dull Watts nickel deposits containing sulfur had a higher rate of corrosion and developed a greater number of perforations in an industrial exposure than did sulfur-free Watts deposits. Sample[11] reported inferior ratings for bright nickel-chromium coatings as compared with buffed dull nickel-chromium at a Kure Beach exposure. Edwards,[12] however, states that both types of nickel coatings give about the same result in industrial and marine exposures. Flowers, et al[13] found that some proprietary bright nickels and Watts deposits prepared from solutions containing addition agents with sulfonic acid groups corroded more rapidly than pure nickel deposits in distilled water containing carbon dioxide. Wesley[14] lists sulfur among other elements which may make nickel more reactive.

Although there are indications that bright nickel deposits may be more reactive than dull nickel, the data are not unequivocal.

*Research Laboratory, The International Nickel Company, Inc., Bayonne, N. J.

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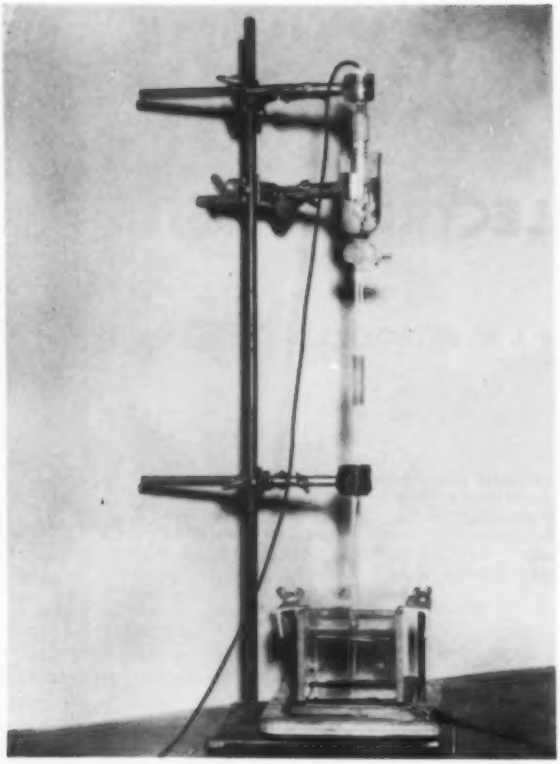

Fig. 1. Electrochemical activity cell.

BASIS FOR ELECTROCHEMICAL REACTIVITY TEST

The corrosion of decorative coatings in most service conditions is predominantly, if not entirely, aqueous corrosion. The process is therefore electrochemical and governed by electrochemical principles. The dissolution process may be divided into two simultaneously occurring reactions: (1) the anodic reaction in which the metal ions leave the metal and (2) the cathodic process by which the electrons leave a metal. The rate of both reactions depends upon the bulk properties of the metal, the surface characteristics of the metal and the solution composition, temperature, etc.[15, 16, 17]

The anodic polarization curve of a metal in a given solution and set of conditions such as temperature, degree of agitation, etc. is a measure of the electrochemical reactivity of the metal under the given conditions. This reactivity is directly related to the inherent tendency of the metal to undergo dissolution or corrosion.

A comparison of such curves for various metals and alloys yields information on their relative electrochemical reactivity or corrosivity. Many investigators have made use of such curves for determining the corrosion characteristics of metals.[18]

Instead of determining the polarization curves, the metals may be subjected to a given electrode potential and the values of the current densities compared. This may be designated the potentiostatic method. Although localized reactivity—due to differences in surface composition, structure, etc.—can be determined by the potentiostatic method, dissolution at a constant current may prove more readable for determining tendencies for localized corrosion—pitting, etc. Thus the "relative pitting tendency" may be obtained by subjecting the metal to a constant average current density and noting selective etching, pitting or perforation. This is designated as the galvanostatic method.

Several investigators have used the electrochemical technique for a controllable and reproducible pit initiation test.[15, 19] Streicher[20] showed that the pitting resistance of stainless steels may be determined and compared by polarizing anodically to a maximum current density and then maintaining this current for a given time.

Electrochemical methods have also been used to determine the porosity of plated coatings.[21] Pierce and Pinner[22] used the electrochemical method to evaluate the corrosion resistance of nickel coatings on steel.

The method developed in this work is somewhat similar to that used in the last two cited studies[21, 22] but with the important difference that either the *electrode potential* or the *average current density* is controlled and held constant. This modification allows for definite control over the corrosion rate and as will be shown in a subsequent report, may lead to an improved accelerated corrosion test method.

METHOD AND PROCEDURE

Electrodeposited nickel foils, 1.7 mils thick, were prepared from various plating solutions and under various conditions by stripping deposits plated on highly polished stainless steel. The underside of each foil was then stopped off with Unichrome 323 red coating. The foils were carefully checked for initial porosity in a light box. The foils were mounted in the cell shown in Fig. 1. This cell, which is similar to that used by Pierce and Pinner,[22] consisted of the nickel electrode, exposed area of 1⅛ sq in. (75 cm^2), as the horizontal electrode at the bottom with a platinum mesh electrode 9 sq in. (56 cm^2) mounted horizontally about 2 in. above the nickel.

The cell was filled with 450 ml of solution and the experiments run at room temperature. The potential of the nickel was measured against a saturated calomel cell using the Luggin capillary technique. The electrode potentials reported are based on the saturated calomel electrode scale.

The open-circuit potential of the nickel was measured with time until a steady state was reached—usually about 30 minutes. The nickel was then polarized to the desired value.

At the end of the experiment the nickel foil was thoroughly examined microscopically and with the light box for surface pitting and perforations.

Most of the data was obtained in an air-saturated 3 per cent (0.5 N) sodium chloride solution at *p*H 6.0–6.5. Some experiments were also done in air-saturated 3.6 per cent (0.5 N) sodium sulfate solutions adjusted to *p*H 2, 4 and 6 with sulfuric acid. Nickel displays a fairly well defined mixed potential in dilute acid solutions and in both sodium chloride and sodium sulfate.[23]

In one set of experiments the nickel was anodically polarized at a constant average current density of 2 microamp/cm^2 for two and one-half hours. It may be of interest to note that this current is equivalent to about 1 mil per year of uniform dissolution. The electrode potential was recorded against time and the amount of surface pitting and number of perforations noted.

In other experiments the nickel was anodically polarized at a constant potential 100 millivolts more noble than its steady state open-circuit potential for two hours. The average current density was recorded with time.

TABLE I

PLATING BATH COMPOSITIONS, OPERATING CONDITIONS AND APPEARANCE OF DEPOSITS

Bath	Constituent, g/l	Plating Conditions	Deposit Appearance
Watts	Nickel Sulfate 330 Nickel Chloride 45 Boric 38	*Effect of pH:* pH 1.5, 3.0, 5.0 140F, 40 asf	Matte
Watts	As above	*Effect of temp.:* 95, 125, 140, 150F 40 asf, pH 3	Matte
	Effect of Cl^- Conc.:		
Watts	As above	50 asf, pH 3 140F	Matte
Sulfate-Chloride	Nickel Sulfate 190 Nickel Chloride 168 Boric Acid 38	As above	Matte
Chloride	Nickel Chloride 370 Boric Acid 38	As above	Matte-semi-bright
	Effect of Addition Agent:		
Watts	2-butyne-1, 4-diol 0.5	50 asf, pH 3 140F	Semi-bright
Watts	Coumarin 0.3	As above	Semi-bright-bright
Watts	p-toluenesulfonamide 0.18	As above	Semi-bright
Watts	Coumarin 0.3, p-toluenesulfonamide 0.18	As above	Bright
Watts	Na thiosulfate 0.03	As above	Semi-bright

Nickel foils were prepared from some proprietary bright nickel baths and from conventional Watts-type plating solutions. The effect of *p*H and temperature change in the Watts bath on the electrochemical reactivity of the deposit was studied. The effect of chloride ion concentration was determined by using foils obtained from Watts, sulfate-chloride, and all-chloride baths. In addition, experiments were made with semi-bright and bright foils prepared from Watts baths containing several known addition agents. Table I lists the various bath compositions, plating conditions and the appearance of the deposits.

Deposits obtained with sodium thiosulfate or p-toluenesulfonamide (with and without coumarin) and all commercial bright nickels had a sulfur content of 0.03–0.10 per cent by weight, while all other deposits had much lower values of 0.002 to 0.004 per cent.

None of the foils reported in this work was chromium plated.

RESULTS

Although it is planned to report and discuss data on the anodic polarization curves in a subsequent publication, the curves shown in Fig. 2 may be of interest here.

Curves A, B, C and D represent anodic semi-logarithmic plots of E versus I, for Watts nickel, chloride nickel, semi-bright nickel prepared from a Watts bath containing p-toluenesulfonamide and a semi-bright nickel from a Watts bath containing sodium thiosulfate as an addition agent, respectively, in 3 per cent NaCl.

It should be noted that the open-circuit potential decreases from Watts to sulfur-containing nickel deposits, and that the positions of the Tafel lines indicate greater reactivity from the Watts to the semi-bright deposits. The increase in reactivity is also manifest in the corrosion rate on open-circuit. This rate is obtained from an extrapolation of the Tafel line to the open-circuit potential.[16, 23, 24]

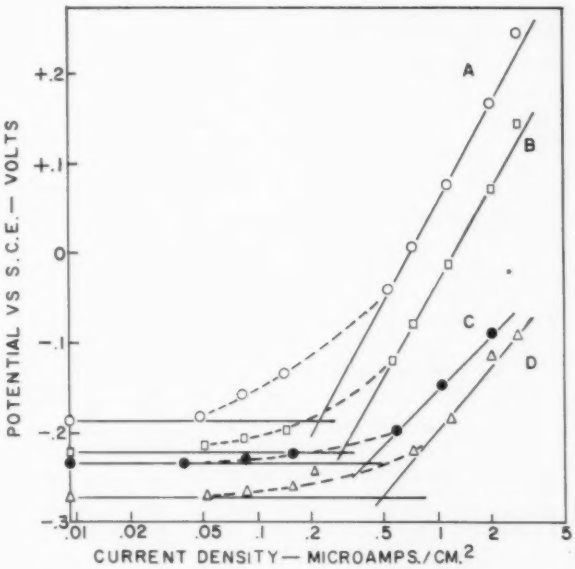

Fig. 2. Anodic polarization curves for different nickel deposits in 3 per cent NaCl: A) matte Watts. B) matte chloride. C) semi-bright from Watts bath containing p-toluenesulfonamide. D) semi-bright from Watts bath containing sodium thiosulfate.

The corrosion currents, $_{corr.}$, were about:

Watts Ni	0.2 microamp/cm²
Chloride Ni	0.3 microamp/cm²
Semi-bright Ni with p-toluenesulfonamide	0.4 microamp/cm²
Semi-bright Ni with sodium thiosulfate	0.5 microamp/cm²

RELATIVE ELECTROCHEMICAL REACTIVITIES

The results of the constant potential experiments are shown in Figs. 3, 4, 5, 6 and 7. The positions of the apparent current density-time curves are an indication of the relative electrochemical reactivities of the different nickel deposits. The more electrochemically reactive deposits exhibit higher current densities. All of the data shown are for immersion in air-saturated 3 per cent NaCl solution at *p*H 6.0–6.5.

The current density-time curves in Fig. 3 are for typical commercial bright, semi-bright and matte Watts deposits. The results show that the semi-bright and Watts deposits had essentially the same order of reactivity while the bright deposit exhibited a higher order of reactivity. Another distinguishing characteristic shown by the bright nickel is its increase in reactivity with time in contrast to the relative stability of the semi-bright and Watts reactivities.

In order to obtain some insight into the factors responsible for the increased reactivity of the bright deposits a series of constant potential experiments were made with foils obtained from Watts baths to which were added different known addition agents. Figure 4 shows that the current density-time

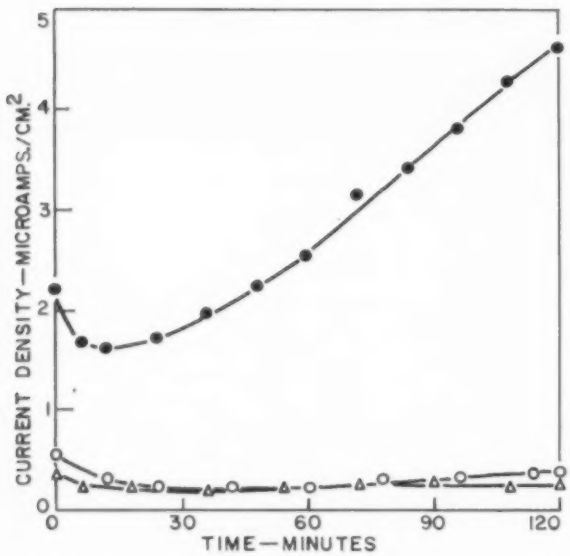

Fig. 3. Current density-time curves for nickel deposits anodically polarized at constant potential in 3 per cent NaCl: ●—commercial bright nickel at −158 mv, ○—commercial semi-bright nickel at −119 mv, Δ—matte Wetts deposit at −95mv.

curves obtained with these deposits reflect two distinctly different orders of reactivity. The deposits formed with sulfur-free addition agents are much less reactive than those formed with sulfur-containing brighteners. As mentioned earlier, the more reactive deposits were much higher in sulfur content. All of the addition agents produced semi-bright deposits; while the combination of p-toluenesulfonamide and coumarin gave a bright deposit.

Some recent work indicates that "sulfur-free" bright nickel deposits have low relative electrochemical reactivities similar to matte Watts and semi-bright nickel deposits of low sulfur content.[25]

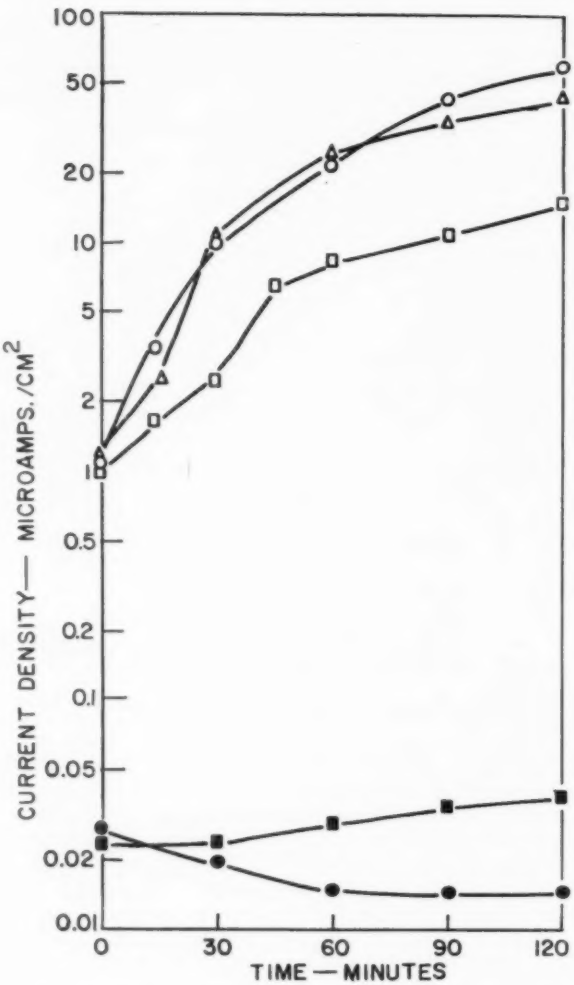

Fig. 4. Effect of addition agents on the current density-time curves for nickel deposits anodically polarized at constant potential in 3 per cent NaCl, pH 6.0–6.5: ●—2-butyne-1, 4-diol, semi-bright, at −122 mv, ■—coumarin, semi-bright, at −104 mv, ○—p-toluene-sulfonamide, semi-bright, at −125 mv, □—p-toluene-sulfonamide and coumarin, bright, at −111 mv, Δ—sodium thiosultate, semi-bright, at −120 mv.

The effect of a few plating variables on the reactivity of matte sulfur-free nickel deposits was investigated. Figures 5, 6 and 7 show current density-time curves for the constant potential polarizations of deposits obtained from plating baths whose *p*H, temperature and chloride concentration, respectively, were varied. All of the curves for the all-chloride, chloride-sulfate and all of the Watts nickels indicate reactivities within a single order of magnitude—below that of the sulfur-containing semi-bright and bright deposits.

RELATIVE PITTING TENDENCIES

A more complete characterization of the corrosion behavior of electrodeposits would include the determination of their relative pitting tendencies. To obtain a measure of their pitting tendencies the deposits were anodically polarized to a

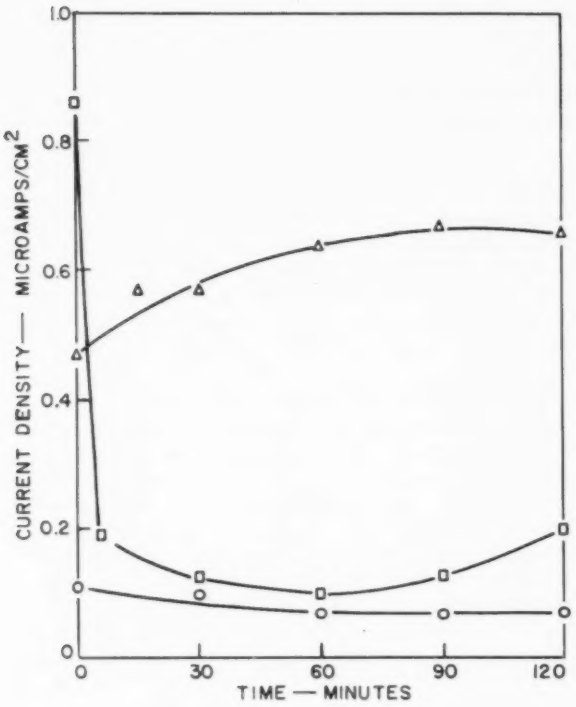

Fig. 5. Effect of plating bath pH on the current density-time curves for Watts nickel deposits anodically polarized at constant potential in 3 per cent NaCl, pH 6.0–6.5: Δ—pH 1.5, at −84 mv, O—pH 3, at −95 mv, □—pH 5, at −85 mv.

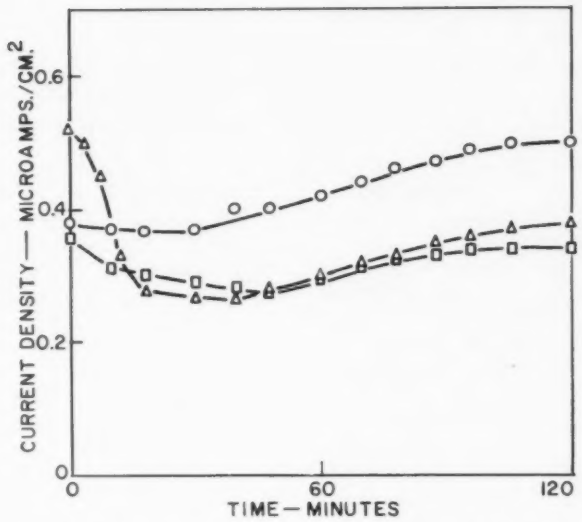

Fig. 7. Effect of chloride concentration on the current density-time curves for nickel deposits anodically polarized at constant potential in 3 per cent NaCl, pH 6.0–6.5: Δ—Watts Ni, at −93 mv, □—Sulfate-chloride Ni, at −101 mv, O—chloride Ni, at −118 mv.

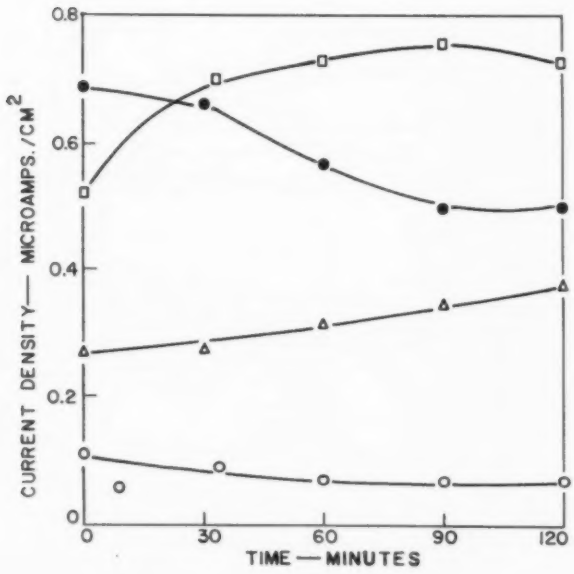

Fig. 6. Effect of plate bath temperature on the current density-time curve for Watts nickel deposits anodically polarized at constant potential in 3 per cent NaCl, pH 6–6.5: ●—95F, at −119 mv, □—125F, at −90 mv, O—140F, at −95 mv, Δ—150F, at −121 mv.

constant apparent current density of 2 microamperes per cm² for 150 minutes. After the polarizations, the 1.7 mil foils were inspected for pits. The perforation count and the total area perforated were determined for each foil. The data, given in Table II show that semi-bright and bright nickel deposits containing 0.03 to 0.05 per cent (by weight) sulfur had relatively strong pitting tendencies in 3 per cent NaCl as indicated by the high perforation counts and/or large total areas of perforation. The matte Watts, chloride, chloride-sulfate nickels and the semi-bright deposits obtained with sulfur-free addition agents underwent less pitting. Watts deposits obtained from plating baths set at *p*H values from 1.5 to 5.0 and temperatures 95 to 150F exhibited weak pitting tendencies.

Deposits which exhibited extensive pitting had high perforation counts. A commercial semi-bright-bright duplex nickel was one exception to this rule. The top bright nickel layer of the duplex coating had a large number of pits but none of them penetrated through the semi-bright bottom layer. The bright nickel overlay had a high sulfur content.

It is also interesting to note that the semi-bright deposit obtained by use of an inorganic addition agent, sodium thiosulfate, yielded a high degree of pitting. However, the total area perforated was relatively small. The semi-bright deposit obtained with p-toluenesulfonamide produced different results with only a few large perforations. The addition of coumarin to the bath containing the sulfur-containing brightener gave a bright deposit which yielded the same total area of perforation but greatly increased the perforation count.

Another pitting characteristic of some fundamental importance was the geometric shape of the pits. Microscopic examination showed that the shallow and deep pits of the "sulfur-free" deposits were irregular, non-circular or ragged with an occasional lace-like structure. The pits in the high-sulfur containing deposits, on the other hand, usually yielded clean circular pits or perforations.

TABLE II

THE RELATIVE PITTING TENDENCIES OF VARIOUS NICKEL FOILS IN 3 PER CENT NaCl

Plating Bath	Surface Tested	Pitting Character	Area, Perforated, mm²	No. of Perforations
Watts	Matte	Few non-circular, lacy pits	0.003	6
Watts	Buffed	Few non-circular pits	0.01	6
Watts	Reverse side	Few non-circular pits	0.002	1
Chloride-sulfate	Matte	No visible pitting	0	0
Chloride	Matte	Few non-circular pits	0.01	6
Watts + Coumarin	Semi-bright	Few non-circular pits	0.002	1
Watts + 2-butyne-1, 4-diol	Semi-bright	More non-circular pits	0.002	5
Commercial	Semi-bright	More non-circular pits	0.1*	7
Watts + p-toluene-sulfonamide	Semi-bright	Few clean circular pits	0.5	6
Watts + $Na_2S_2O_3$	Semi-bright	Many small circular pits	0.04	33
Watts + Coumarin + p-toluenesulfonamide	Bright	Many circular pits	0.4	22
Commercial A	Bright	Many circular pits	0.8	38
Commercial B	Bright	Many circular pits	0.9	18
Commercial C	Bright	Many circular pits	0.5	82
Commercial Semi-bright-bright duplex	Bright	Many circular pits	0	0

*rough approximation—some lacy perforations.

Potential-time curves, shown in Figs. 8 to 12 inclusive, were obtained from the constant current density polarizations in 3 per cent NaCl. In all cases, the potential values plotted at zero time are the "steady" open-circuit potentials just before the start of the polarizations. These curves give some indication of the relative electrochemical reactivities of the different deposits. Deposits yielding curves at lower or more active potentials possessed the higher relative reactivities.

Figure 8 compares the potential-time curves for some commercial bright and semi-bright nickels with those for some Watts deposits. Here again, there is indication of higher reactivities for the sulfur-containing bright nickel electroplate (including a duplex deposit). The "sulfur-free" semi-bright and Watts deposits show lower reactivities. An interesting observation was made with the bright, mirror-like reverse side of Watts foils. For some of these Watts foils, the potentials recorded during the first 20 to 30 minutes were in the more active region normally assigned to the bright deposits. After this short period of time there was a potential shift to more noble values. This behavior, confined to the smooth surface of the deposit, requires further investigation, and no explanation can be offered at present.

The effect of known sulfur-free and sulfur-bearing addition agents on the potential-time curves is shown in Fig. 9. All of the deposits were semi-bright except for the bright nickel obtained with an addition agent mixture of p-toluenesulfonamide and coumarin. The curves indicate more reactive electrodeposits with the sulfur-containing additives.

Figures 10 and 11 indicate that the effects of Watts plating bath *p*H and temperature on the relative reactivities of the deposits was insignificant. Fig. 12 shows that Watts, chloride-sulfate and chloride nickels have essentially similar reactivities.

In addition to the polarizations in 3 per cent sodium chloride solution at *p*H 6.0–6.5 some study was made of the relative reactivities and pitting tendencies of various nickel deposits in 0.5 N sodium sulfate at *p*H 2, 4 and 6.

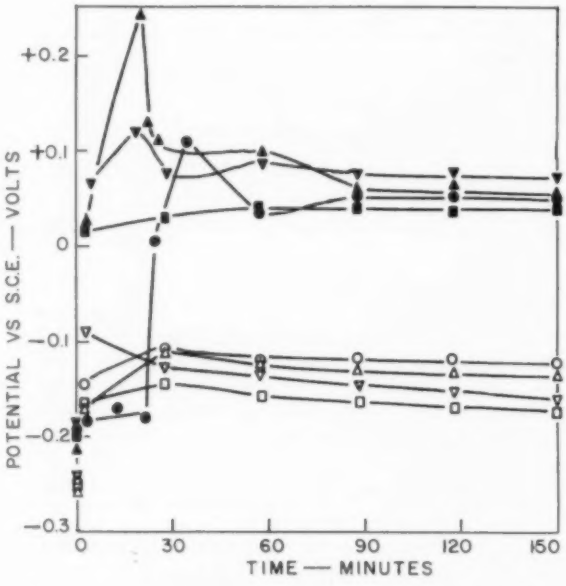

Fig. 8. Potential-time curves for nickel deposits anodically polarized at constant current density of 2 microamp/cm² in 3 per cent NaCl, pH 6.0–6.5: ○, ▽, □—commercial bright nickel deposits, △—commercial duplex nickel, ■—commercial semi-bright, ●—reverse side of Watts deposit, ▲—buffed Watts deposit, ▼—matte Watts.

The potential-time curves in Fig. 13 show the effect of changing the *p*H of the sulfate solution from 2 to 6 for Watts deposits anodically polarized at a constant current density of 1 microampere per cm² for 150 minutes. At *p*H 4 and 6 the matte Watts nickel gradually went passive—with less time taken in a *p*H 6 medium. At *p*H 2, the deposit remained active. There was no visible attack of the nickel deposits in the sulfate medium at *p*H 6; however, some slight pitting was evident at *p*H 2 and 4. In addition, some general attack of the Watts surface was evident at *p*H 2. In contrast, the polarization of a commercial bright nickel in 0.5 N sodium sulfate at *p*H 6 yielded a curve indicating relatively high reactivity. At the end of the polarization, the sulfur-containing bright nickel was extensively pitted with the formation of a large number of circular perforations.

Effect of known addition agents on the relative pitting tendencies of deposits polarized at 2 microamp/cm² in 0.5 N sodium sulfate, *p*H 2, was investigated. At this low *p*H, no perforations were obtained with electroplates formed with sulfur-free or sulfur-bearing addition agents. Watts deposits and those obtained with coumarin showed some general attack and slight shallow pitting. A commercial bright nickel and deposits obtained with p-toluenesulfonamide were more extensively pitted, yielding a large number of shallow pits. The potential-time curves in Fig. 14 indicate that the "high-sulfur" nickels are more reactive than the "sulfur-free" deposits.

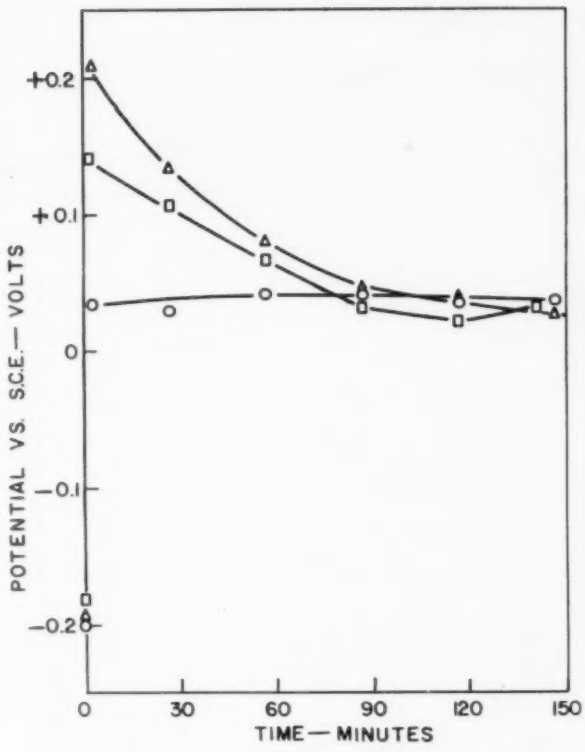

Fig. 10. Effect of plating bath pH on the potential-time curve for Watts nickel deposits anodically polarized at constant current density of 2 microamp/cm² in 3 per cent NaCl, pH 6.0–6.5: □—pH 1.5; Δ—pH 3; O—pH 5.

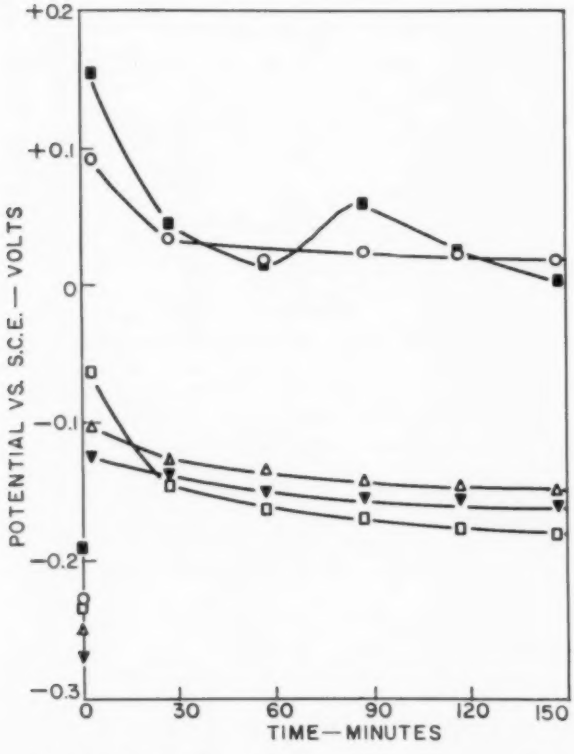

Fig. 9. Effect of addition agents on the potential-time curve for nickel deposits anodically polarized at constant current density of 2 microamp/cm² in 3 per cent NaCl, pH 6.0–6.5: O—2-butyne-1, 4-diol; ■—coumarin; □—p-toluene sulfonamide; Δ—p-toluenesulfonamide and coumarin; ▼—sodium thiosulfate.

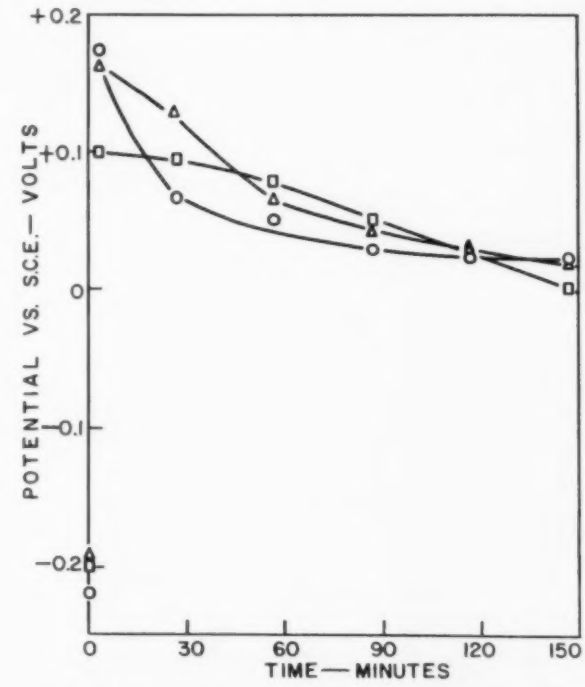

Fig. 11. Effect of plating bath temperature on the potential-time curve for Watts nickel deposits anodically polarized at constant current density of 2 microamp/cm² in 3 per cent NaCl, pH 6.0–6.5: O—95F; □—125F; Δ—150F.

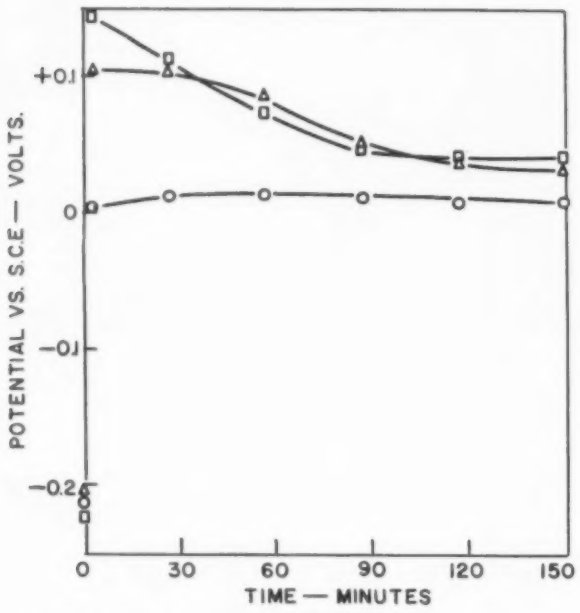

Fig. 12. Effect of chloride concentration on the potential-time curve for nickel deposits anodically polarized at current density of 2 microamp/cm² in 3 per cent NaCl, pH 6.0–6.5: Δ—matte Watts; O—Sulfate-chloride nickel; □—chloride nickel.

DISCUSSION OF RESULTS

The above electrochemical methods of classification of nickel electrodeposits with regard to their relative reactivities and pitting tendencies strongly indicate that the sulfur content

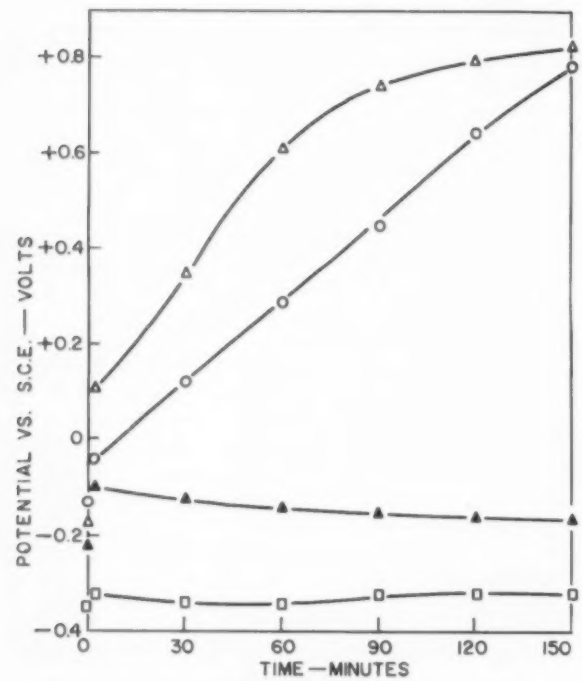

Fig. 13. Potential-time curves for Watts nickel deposits anodically polarized at constant current density of 1 microamp/cm² in 0.5 N Na_2SO_4 adjusted to pH 9, 4 and 6: Δ—matte Watts, pH 6; O—matte Watts, pH 4; □—matte Watts, pH 2; ▲—commercial bright nickel, pH 6.

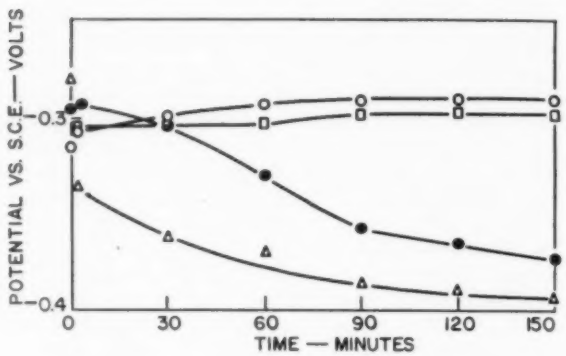

Fig. 14. Effect of addition agents on the potential-time curve for nickel deposits anodically polarized at constant current density of 2 microamp/cm² in 0.5 N $NaSO_4$, pH adjusted to 2: O—coumarin, semi-bright; □—matte Watts; ●—p-toluenesulfonamide; Δ—commercial bright nickel.

in the coatings plays a major role. In every instance where the sulfur content was 0.03 per cent by weight or higher the deposit had a higher relative electrochemical reactivity and a greater pitting tendency. This was true whether the deposits were semi-bright or bright.

Since the reactivity of sulfur-containing deposits may be due to the presence of nickel sulfide, the electrochemical behavior of this compound was determined in the air-saturated 3 per cent sodium chloride solution. The corrosion potential (open circuit potential) was about −0.260 v and the corrosion current on open circuit was about 40 microamp/cm². This indicates that the presence of nickel sulfide in the nickel could account for the enhanced reactivity.

Recently a "sulfur-free" bright nickel deposit was prepared which showed low reactivity and pitting tendency comparable to a Watts deposit.[25] X-ray diffraction analysis of this deposit and one obtained with an addition agent combination of p-toluenesulfonamide and coumarin showed a crystallite size of approximately 150A for both deposits. As described above, the latter coating, with a high sulfur content, was more reactive and had a much greater pitting tendency. Therefore, it seems that small crystallite size and brightness do not greatly affect the corrosion behavior of the nickel deposits.

Matte Watts deposits which had coarser grain structures behave like the "sulfur-free" bright and semi-bright nickel coatings.

As previously indicated, the reactivity of nickel deposits will play an important role in the corrosion behavior of decorative coatings when an overlay of chromium is present. If not initially, certainly at some early stage of the corrosion process, the nickel will be involved. Therefore, the relative reactivities and potentials discussed here are very pertinent. The more reactive nickel should—all other conditions remaining constant—corrode more rapidly. The results indicate that in corrosive media of about *p*H 3 and higher the sulfur-containing deposits have a lower corrosion resistance than sulfur-free deposits.

On the other hand, the more reactive nickel should sacrificially protect an underlying sulfur-free deposit such as found in some of the commercially popular duplex-nickel coatings. These and other data[25] obtained in this laboratory confirm and explain the superior results being obtained with duplex-nickel systems.[7, 26]

The difference in the reactivities of the sulfur-containing and sulfur-free deposits tends to become less in chloride-free

media at low *p*H. Although this behavior requires further study, it does seem to correlate with some observations that the various deposits behave differently in marine environments than in some industrial exposures where chlorides and *p*H are significantly lower.

It should be noted that measurements of the electrode potential on open circuit (corrosion potential) alone cannot be safely used as an index of reactivity.[16, 27] The relationship between the potential and the current is the meaningful characteristic. It is hoped that the rather simple test methods introduced in this study will furnish another tool for the further improvement of decorative coatings.

The methods are presently being used in this laboratory to study nickel-chromium composites with what appears to be promising results.

It should be noted that work still in progress indicates that the difference in the reactivity of sulfur-containing nickel and sulfur-free nickel involves the passivating tendency of the metal in addition to an "activation" type of reactivity. The sulfur-free deposits, such as Watts, seem to passivate much more readily than the sulfur-containing deposits. This factor may play an important role in the corrosion behavior—particularly with coatings which do not have a chromium overlay. Data along these lines will be reported in the future.

CONCLUSIONS

An electrochemical technique has been developed to classify or evaluate the relative electrochemical reactivities and pitting tendencies of nickel deposits.

The results indicate that the sulfur content in the deposits is a major factor in determining the relative corrosion behavior of different nickel coatings. The high sulfur content, usually present in bright nickels, seems to be responsible for the higher relative reactivities and greater pitting tendencies of some deposits.

The greater electrochemical reactivity of sulfur-containing deposits as compared to the sulfur-free deposits explains the corrosion behavior noted with duplex-nickel coatings in certain environments. The former tend to be anodic to and corrode more rapidly than the latter thus exhibiting a sacrificial protective action.

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ELECTROPLATING ONTO ZINC-TITANIUM-COPPER ALLOY

by R. SCOTT MODJESKA and SIMON P. GARY*

A NEW ZINC RICH ALLOY has recently been developed and is being marketed under the trade name Hydro-T-Metal.** This metal is an alloy of titanium, copper and high grade zinc, plus traces of manganese and chromium. Chemical composition and physical and mechanical properties of this alloy are shown in Tables I and II.

Hydro-T-Metal is manufactured in sheet form by pack rolling and is available in a special finish known as platers' quality. The finish on this sheet is similar to the No. 2 finish on cold rolled steel. Rms values for this sheet average from 4–7 and the surface has no visible pits, cracks or rolled-in imperfections. Unlike zinc die castings, the subsurface is free from pores or voids.

Because of its excellent physical properties and its ease of fabrication by stamping, drawing, spinning and roller forming, it is finding wide usage for such applications as:

Automotive moldings, trim, grills, reflectors and bezels.

Costume jewelry, cuff links, tie bars, belt buckles, medallions, buttons, etc.

Table flatware, compotes, serving dishes, trays, bowls, etc.

Since most of these applications would call for plating, a thorough investigation was made to determine the best methods of polishing, buffing, cleaning and plating this metal. The results of this investigation follow.

POLISHING AND BUFFING

Laboratory evaluation of buffing and polishing characteristics still leaves much to be desired. Therefore, the buffing and polishing characteristics were established by submitting test panels to several polishing and buffing foremen for processing and then asking their opinions of these properties. Their observations were:

In general, the rolled surface will be suitable for buffing. However, if prior forming or metal working has produced an unusually rough, nicked or pitted surface, a polishing operation, using abrasive belts, is recommended in order to remove major surface imperfections. This can be done on a typical belt polishing set-up, using a conventional 14-in. cloth contact wheel of medium density. A 180 or 220 grit cloth abrasive belt with silicon carbide grain and a good belt lubricant, are recommended.

On normal stamped, rolled or polished surfaces, any standard procedure used in preparing non-ferrous metals by buffing will generally be satisfactory. The recommended procedure for properly cutting down the Hydro-T-Metal surface requires a 14-in. bias-type buff made from 89/93 count cloth, 14 or 16 ply, type 2, (at range of 1200–1700 rpm) using a fairly greasy all tripoli buffing compound.

For extremely high color or mirror-type finishes, the above operations must be followed by a coloring operation using a 12- or 14-in. full disc buff made from 64/68 count cloth, 20 ply, and an alumina type coloring rouge, at 900–1500 rpm.

To produce a satin or scratch type surface the recommended conditions are the same as for the coloring operation except that the compound should be a greaseless type containing 220 grit aluminum oxide grain.

CLEANING AND PICKLING

The purpose of this investigation was not to develop cleaner formulations, but rather to determine if present commercial cleaners recommended for use with zinc base die castings would be satisfactory for use with this alloy. It was also desired to establish the range of operating conditions allowable in the acid pickle, between the cleaning and plating operations.

To do this 4 by 6 in. flat panels were degreased and then processed in the following manner:

Electroclean	Many different commercial cleaners—current and time were varied as noted.
Rinse	Cold water.
Acid dip	Varied as noted.
Rinse	
Copper plate—0.0003 in. thick—Standard Rochelle Copper.	
Rinse	
Dip in 2 per cent by volume sulfuric acid (10 seconds)	
Rinse	
Nickel plate—0.0002 in. thick—Watts nickel.	

The plated test panels were cut in half and one-half was heated to 400F for one hour. Both halves were then examined visually for blistering or other defects.

After the visual examination both halves were deformed in a 2-in. cupping die. In this test a 2-in. circle was blanked out and drawn into a cup $\frac{1}{8}$ in. deep, inverted, and drawn into a reversed cup $\frac{1}{8}$ in. deep. The cup was then examined for flaking or peeling of the plating. Figure 1 shows a typical test cup.

TABLE I

CHEMICAL COMPOSITION OF HYDRO-T-METAL

	Minimum Per cent	Maximum Per cent
Titanium	0.080	0.160
Copper	0.40	0.70
Manganese	0.002	0.010
Chromium	0.003	0.020
Zinc (Hi-Grade)	Balance	

TABLE II

MECHANICAL & PHYSICAL PROPERTIES OF HYDRO-T-METAL

Tensile strength, psi	24,000 minimum
Elongation, per cent in 2 in	10 per cent minimum
Rockwell Hardness (15T)	62 minimum
Bends, (0.005– to 0.0625-in. sheets)	180° flat back
Creep Resistance	No creep after 72 hours at 75F and 12,000 psi
Density (lb/cu in.)	0.258
Melting point	792F
Electrical Conductivity—1 per cent IACS	27
Thermal Conductivity (Copper = 100 per cent)	34.5 per cent

* Scientific Control Laboratories, Inc., Chicago, Illinois.
** Trade-mark Illinois Zinc Co., Division Hydrometals, Inc.

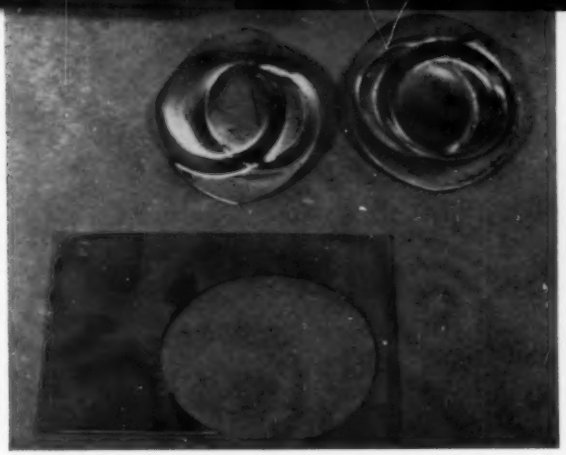

Fig. 1. Cupping test showing test panel "cupped" to evaluate adhesion.

Well over a hundred variations were made in the cleaning and pickling before copper plating and from these experiments the following conclusions were drawn:

1) The common proprietary cleaners based on sodium carbonate, trisodium phosphate, sodium metasilicate and wetting agent are suitable for cleaning this alloy.
2) Either anodic or cathodic cleaning resulted in excellent adhesion on parts which were not heated after plating, but—
3) Upon baking, parts which had been cleaned cathodically usually exhibited small blistering.
4) Either dilute sulfuric acid (1–2 per cent by volume), dilute hydrochloric acid (1–3 per cent by volume) or dilute phosphoric acid (2–5 per cent by volume) were satisfactory for the dip after cleaning.
5) After baking at 400F for ½ hour, a brittle copper-zinc diffusion zone forms. Upon even slight bending this zone ruptures from the base metal, causing the plating to peel. (A study was made of the time-temperature relations of this phenomena and is reported later in this article.)

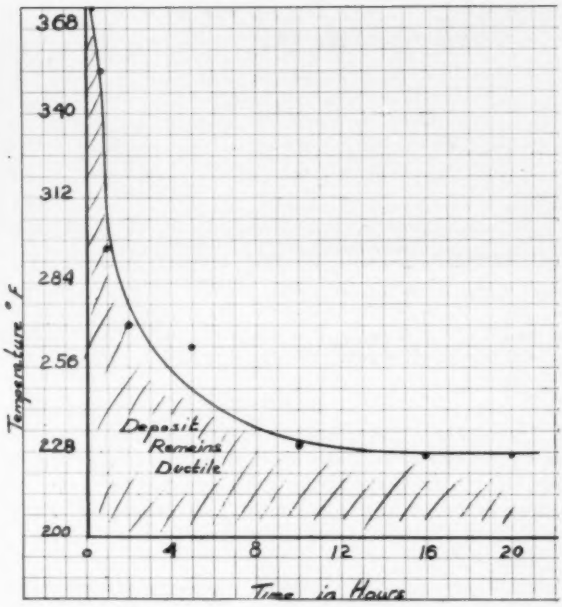

Fig. 2. Time:Temperature relationship for diffusion to cause brittleness in deposit.

The question was raised as to whether the thickness of copper plating was a factor in the blistering or loss of ductility during baking. To determine this a series of tests were made in which either anodic or cathodic cleaning was used and the copper thickness varied between 0.000012 and 0.0008 in. This series showed that:

1) Minimum copper thickness producing satisfactory adhesion was 0.0002 in.
2) Blistering upon baking is related to electrocleaning polarity and is not a function of copper thickness.

TABLE III

COMPARATIVE SALT SPRAY AND CASS EXPOSURE FOR PLATED ZINC DIE CASTINGS AND PLATED HYDRO-T-METAL

		20 Per Cent Salt Spray HOURS TO FAILURE		CASS Test HOURS TO FAILURE	
	Inches	Zinc Die Casting	Hydro-T-Metal	Zinc Die Casting	Hydro-T-Metal
Group I					
Copper	0.00038	88	192	10	31
Nickel	0.00039				
Chromium	0.000007				
Group II					
Copper	0.00038	72	210	12	36
Nickel	0.00052				
Chromium	0.000008				
Group III					
Copper	0.00038	312*	312*	14	43
Nickel	0.00110				
Chromium	0.000010				

Failure constituted 2 per cent overall corrosion. No large pitting or localized corrosion occurred.

* Test discontinued at 312 hours.

Fig. 3. Copper 0.00038 in., nickel 0.00039 in., chromium 0.000007 in.

Fig. 4. Copper 0.00038 in., nickel 0.00052 in., chromium 0.000008 in.

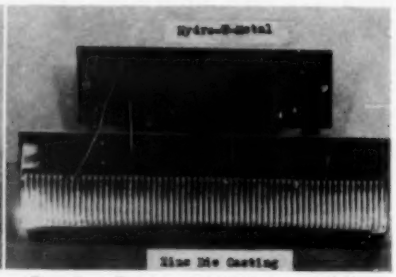

Fig. 5. Copper 0.00038 in., nickel 0.00110 in., chromium 0.000010 in.

Results of CASS exposure of plated zinc die castings and Hydro-T-Metal. All die castings pictured after 12 hours CASS exposure; all Hydro-T-Metal panels pictured after 43 hours CASS exposure.

BAKING

During these experiments it became obvious that baking of copper and nickel plated parts caused alloying (diffusing) of the copper and the Hydro-T-Metal. This diffusion alloy was extremely brittle. Consequently the panel could not be bent at all without the plating flaking off.

Since diffusion is a time-temperature reaction, a study was made to determine the rate of diffusion for this system so that safe baking cycles could be specified.

For this study panels were prepared as follows:

Anodic clean	Cleaner F 6 oz/gal—30 seconds—45 A/SF anodic
Acid dip	2 per cent sulphuric acid—15 seconds (1 per cent by volume)
Rinse	
Copper Plate	0.0008 in.
Rinse	
Acid dip	
Nickel plate	0.0004 in.

These panels were then baked. Times and temperatures were noted at which sufficient diffusion had occurred for the plating to lose its ductility. These were then plotted to form the graph shown in Fig. 2.

It is apparent from this curve that the diffusion rate at room temperature is slowed enough that it does not constitute a problem. However, at elevated temperatures diffusion can become a serious problem. Therefore, baking temperatures and times must be kept to a minimum. For parts which would be subject to flexing, all baking should be avoided.

CORROSION RESISTANCE

A superficial study of the accelerated corrosion resistance properties of copper, bright nickel and chromium plated Hydro-T-Metal parts was made as follows:

Commercial zinc base die castings and test panels of Hydro-T-Metal were buffed to equal finish. The die castings and the test panels were then plated in a job shop under normal plating conditions. This cycle was; normal anodic clean, copper, bright nickel, and chromium plate.

Test panels and die castings from the same rack were then subjected to the neutral 20 per cent salt spray and the CASS test.

Test results are shown in Table III.

Figures 3, 4 and 5 show the results of the CASS test on the die castings and Hydro-T-Metal. The type of failure (pitting) is comparable on both items but the Hydro-T-Metal stood up for a longer time before failure.

It would be presumptuous to draw any conclusions from these few accelerated corrosion tests, but the indications are that plated Hydro-T-Metal will perform better than zinc base die castings plated in the same manner.

SUMMARY

Hydro-T-Metal can be satisfactorily copper plated using processing cycles similar to that for any other zinc alloy—clean, mild acid dip and copper plate.

After the initial plate of copper has been applied standard plating practices can be followed for the application of any deposit desired.

Hydro-T-Metal can be plated in exactly the same manner as a zinc base die casting. Any procedure which works satisfactorily for zinc die castings will be satisfactory for Hydro-T-Metal.

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He is a member of AES, ECS, ASM, ASTM, Faraday Society and a Fellow AIC. He is a Registered Professional Engineer, State of Illinois, and author of numerous technical articles.

Simon P. Gary is vice president of Scientific Control Laboratories and consulting chemical engineer specializing in metal finishing. He joined the company as a chemical engineer in 1945, leaving in 1950 to become plant manager of the Hard Chrome Division of Grunwald Plating Co. He re-associated himself with his present company in 1957.

Mr. Gary received his BS in ChE from Rose Polytechnic Institute and did graduate work at Illinois Institute of Technology where he had also been a laboratory instructor. Management study was subsequently undertaken at Northwestern University.

Among Mr. Gary's researches are studies on electrodeposition of metals on non-conductors, heavy silver electrodeposits, electrodeposition of bismuth and hard chromium deposits. He is a member of AES and The Electrochemical Society, and is a Registered Professional Engineer of the State of Illinois.

THE NATURE, CAUSE AND EFFECT OF THE POROSITY IN ELECTRODEPOSITS

VII. A Microscopic Examination of Nickel-Chromium Coatings after Atmospheric Corrosion

by DONALD W. ERNST* and FIELDING OGBURN†

ABSTRACT

Nickel-chromium coatings on steel, which had been subjected to atmospheric corrosion, were examined microscopically. With chromium, bright nickel was perforated more by pitting corrosion than Watts nickel, but the latter contained many more micropits. Pits which did not extend to the basis metal were similar in appearance regardless of type of nickel or atmosphere. Cracks appeared in chromium plated bright nickel after pits had formed in the nickel.

Observations of galvanic cells in the laboratory showed that the polarity of the nickel-steel couple changes with variations in the electrolyte. These changes can explain differences in pit shapes and in rust exudation associated with sea coast and industrial atmospheres. Also the polarity of nickel-chromium couples was found to change unpredictably in several electrolytes. The chromium was usually found to be the anode. A nickel-bright nickel cell was found to be more active than any nickel-chromium cell.

INTRODUCTION

MANY INVESTIGATIONS have been made of the atmospheric corrosion of nickel-plated steel with and without chromium. In most of these investigations, the nature and extent of the corrosion have been determined solely by visual observations, with the unaided eye, of the exposed surfaces of the coatings. These investigations have produced valid and useful information. To understand the nature of the corrosion process, however, one needs to have more information than is obtainable from visual appearance. For example, information is needed about the microscopic nature of the corroded surfaces of the metal, the history of the defects which ultimately lead to rust spots, and the galvanic effects which are of significance.

An important purpose of this project was to explore some new approaches to the investigation of the corrosion of nickel-plated steel. The first part of this final report of Project 13 covers the microscopic examination of a number of steel panels plated with nickel, or chromium and nickel, which had been exposed outdoors. The second part of the paper covers the microscopic examination of a few panels before and during outdoor exposure. A third part deals with a few exploratory experiments related to the galvanic corrosion of couples of iron, nickel, and chromium.

EXAMINATION OF SPECIMENS AFTER OUTDOOR CORROSION

The specimens‡ which were examined consisted of one-half of standard 4 by 6 inch (10 by 15 cm) steel corrosion test panels, each plated with one of the following coatings:

Designation	Coating
WU	Watts nickel, unbuffed
WB	Watts nickel, buffed
WB, Cr	Watts nickel, buffed, with chromium
A	Bright nickel A
A, Cr	Bright nickel A with chromium
B	Bright nickel B
B, Cr	Bright nickel B with chromium
TT	Double-layer nickel (semi-bright and bright nickel)
TT, Cr	Double-layer nickel with chromium

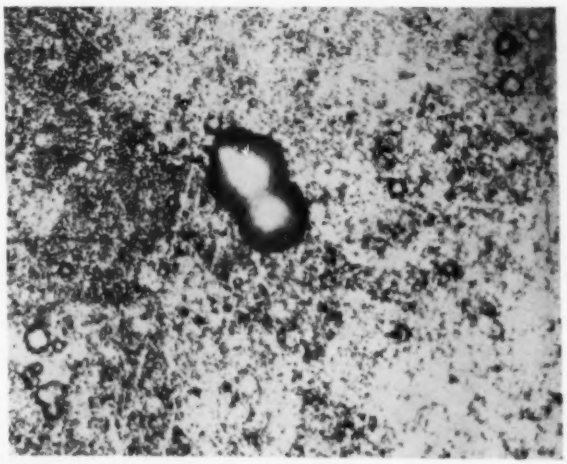

Fig. 1. Surface view of bright nickel A coating without chromium exposed for 49 days at Bayonne. Pit in center is 20μ (0.8 mil) deep. The surrounding area is illustrative of uniform surface attack. (Original magnification 400 X.)

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† Director, AES Research Project 13, National Bureau of Standards, Washington, D. C.
‡ The corroded specimens were provided by The International Nickel Company.

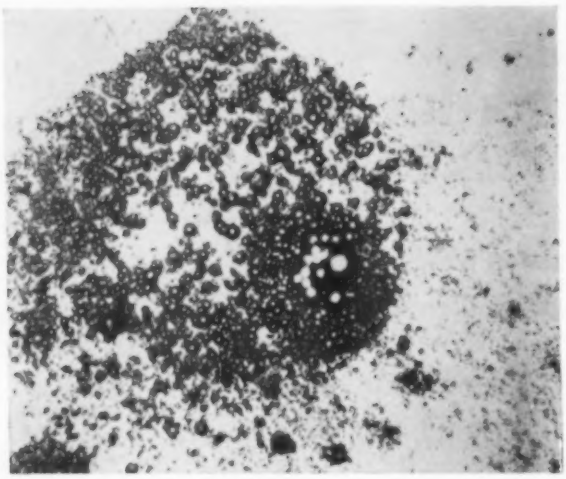

Fig. 2. Surface view of bright nickel A coating without chromium with cluster of pits found after 120 days exposure at Kure Beach. Usually those pits were on the order of 7μ (0.3 mil) deep and they surround a much deeper pit. (Original magnification 400 X.)

Each specimen was plated with about 38 microns (1½ mils) of nickel. The chromium was the usual decorative chromium, about 3 microns (0.01 mil) thick. One set of these specimens had been exposed at Kure Beach, North Carolina, a rural sea coast atmosphere, 250 meters (800 feet) from the ocean, and a second set had been exposed at Bayonne, New Jersey, an industrial atmosphere. Both sets had been exposed for about nine months. There is no record available of the progress of corrosion of these specimens insofar as a detailed microscopic examination and classification of the corrosion pattern is concerned.

The surface of each coating was cleaned and carefully examined microscopically. Cross sections and parallel sections were also examined. Uniform surface attack or etching of the surface appears under the microscope as a multitude of tiny pits randomly distributed. This general surface etching seems to be more pronounced at Bayonne than at Kure Beach. There was, however, no apparent difference in the extent of the surface attack on the different types of nickel such as has been reported from visual observations.

Superimposed on the uniformly attacked surface are the corrosion pits, (including rust spots, which are deep pits filled with rust) which appear as relatively large dark spots or

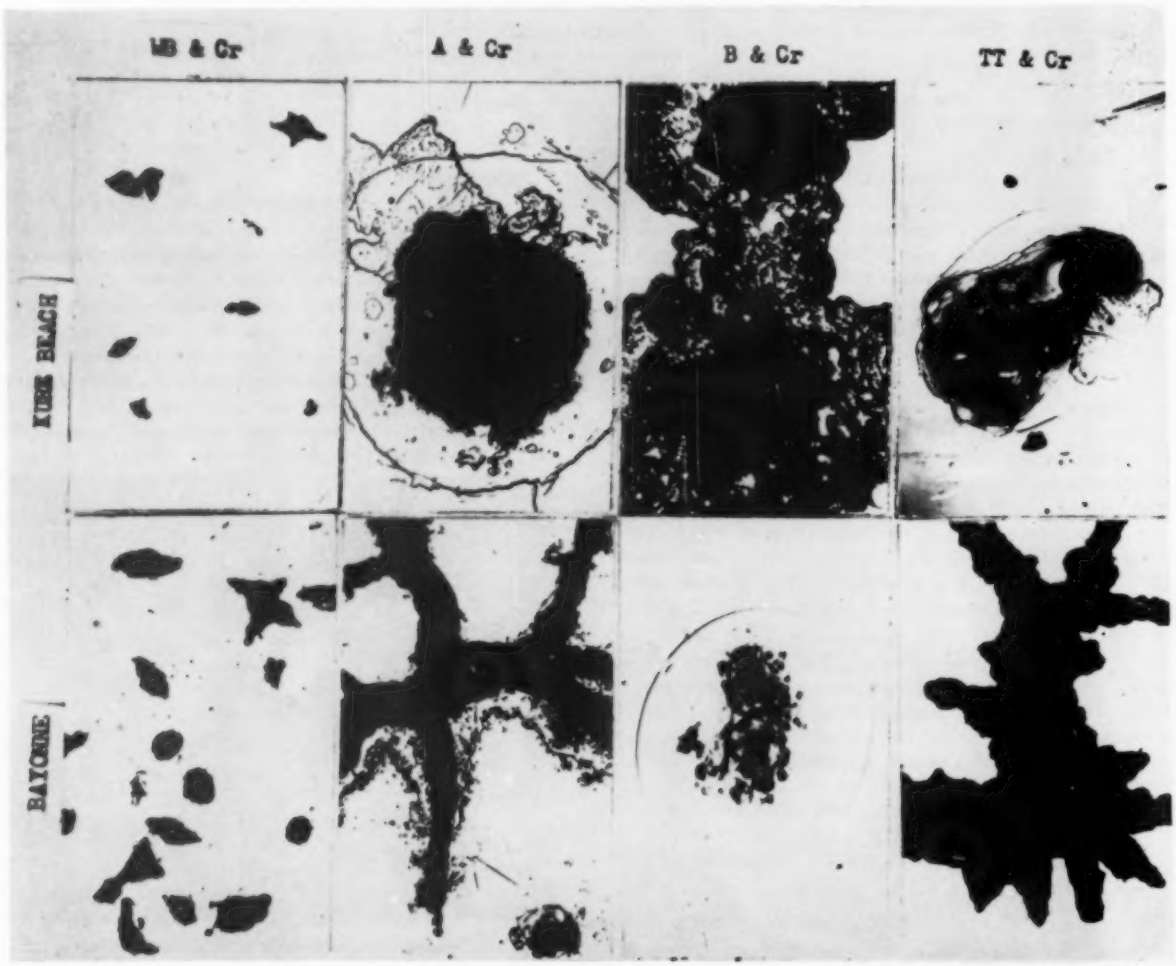

Fig. 3. Surface views of the chromium-plated nickel coatings exposed 9 months at Kure Beach and Bayonne. Rust has been removed. These individual failures are typical of all the failures. (200 X.)

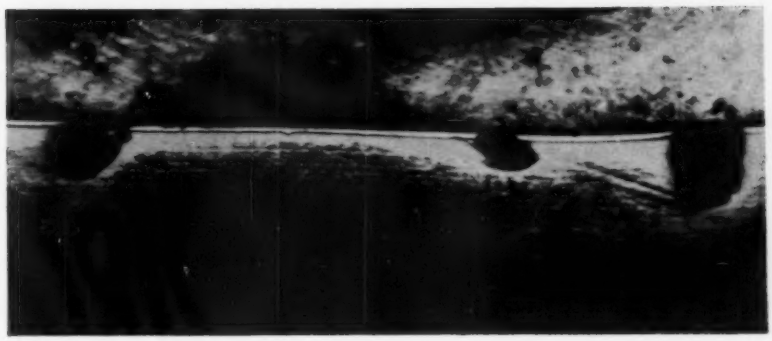

Fig. 4. Cross section of bright nickel A with chromium showing pits extending through chromium layer into the nickel layer. Exposed at Bayonne for 9 months. (400 X.)

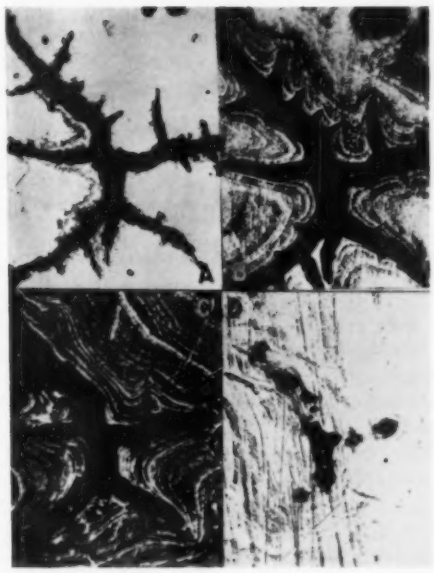

Fig. 5. Parallel section series showing the shape of a crow's-foot at various deposit thicknesses (bright nickel A exposed at Bayonne for 9 months); A. top surface appearance; B. chromium layer just removed (note slight enlargement of crow's-foot); C. approximately one-half way through the deposit; D. close to basis metal; rust is found in the largest group of pits. (200 X.)

areas (surface view) or as relatively wide and deep cavities (cross section view). These pits occurred principally in two forms: as single isolated pits with vertical sides and as clusters of shallow pits. Both types of pits formed at both exposure sites. Examples of each are shown in Figs. 1 and 2 which are photographs of specimens described in the next section of this paper.

The presence of a thin chromium coating over the nickel had a marked effect on the corrosion of the specimens. Figures 3 and 4 are representative micrographs of the chromium plated specimens. The chromium surface is not subject to the general surface etching characteristic of nickel. The chromium layer, however, is obviously perforated and the nickel has been attacked at each perforation of the chromium coating. Thus, in contrast to nickel coatings without chromium, the chromium-nickel coatings had relatively large uncorroded areas.

There were distinctive differences between the pits in chromium plated Watts nickel and chromium plated bright nickel. In the Watts nickel there were many shallow pits, about 150/cm² (1000/in.²) in specimens exposed at Kure Beach and 300/cm² (2000/in.²) at Bayonne, and virtually no rust spots. These shallow pits were too small to see with the unaided eye. The bright nickels, on the other hand, contained considerably fewer pits, about 4/cm² (30/in.²) in specimens exposed at Kure Beach and 16/cm² (100/in.²) at Bayonne. Most of these pits were rust spots at Kure Beach and crow's-feet at Bayonne. These differences between Watts and bright nickel are significant with respect to corrosion mechanism, but the reader should bear in mind that they were

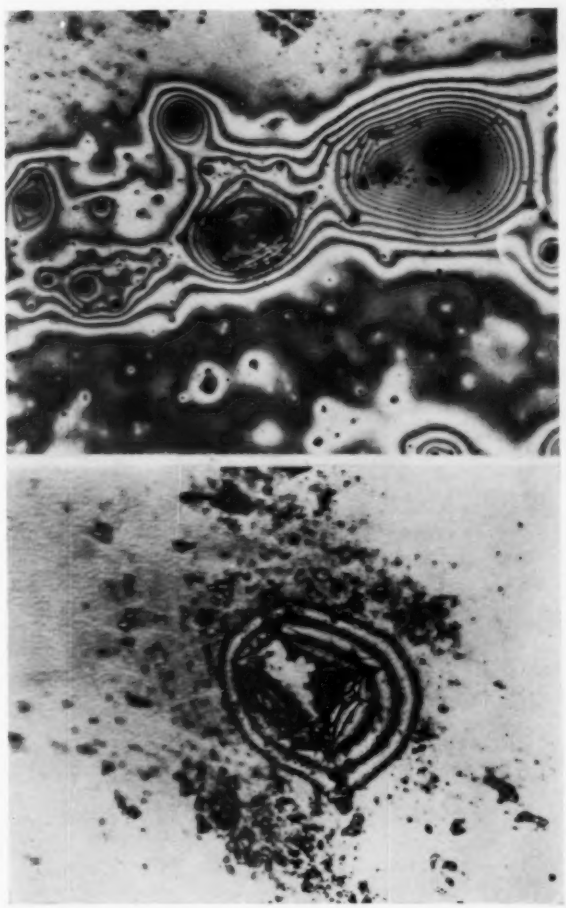

Fig. 6. (TOP.) Dust particles surrounded by varied colored bands. This was frequently found on the chromium-plated coatings. (Original magnification 400 X.)
(BOTTOM.) Enlarged view of failure in an area similar to top photomicrograph. (Original magnification 800 X.)

observed after nine months of exposure. Another year of exposure might have drastically altered the picture.

Crow's-feet are pits with distinctive shapes similar to that shown in Fig. 5A. They are frequently found in chromium plated bright nickel coatings that have been exposed to industrial atmospheres. Usually they extend through the coating to the steel and contain some rust. The four micrographs in Fig. 5 are parallel sections* of a crow's-foot and indicate that the sides of the pit slope towards the central area of the pit so that the steel is exposed only in the center.

Microscopic examination of the chromium surfaces revealed numerous foreign particles adhering to the chromium. Many of these were surrounded by colored circles or interference bands and, not infrequently, a pit had formed beneath or adjacent to the particle. Figure 6 shows two micrographs of this phenomenon which suggests that perforation of the chromium coating may sometimes be attributable to dust particles from the atmosphere.

* Parallel sections refer to sections of the coating produced by polishing parallel to the coating surface. This is in contrast to cross sections which are cut and polished perpendicular to the plane of the coating. See F. Osburn and D. Ernst, PLATING **46**, 831 (1959).

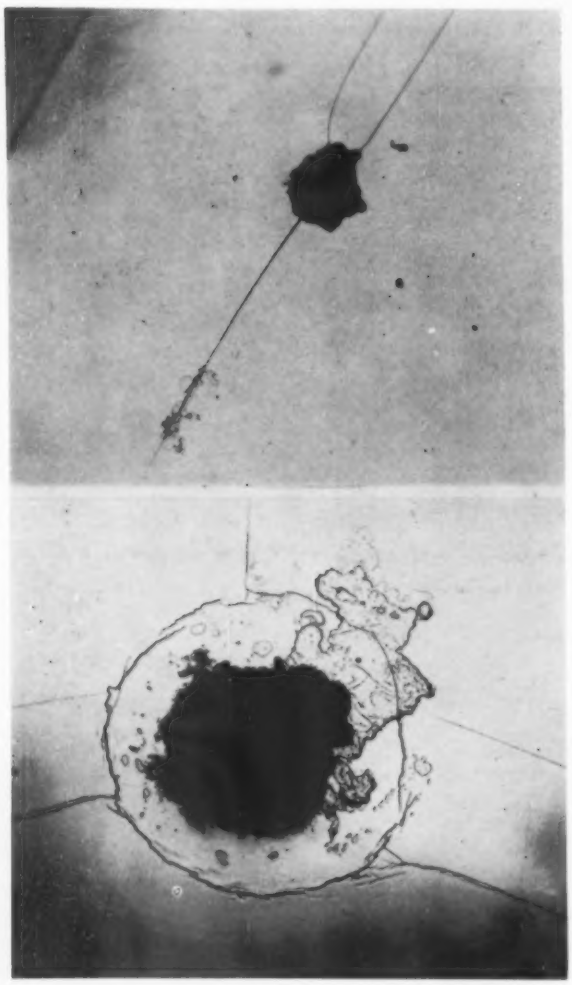

Fig. 7. A. Straight-line crack on bright nickel A with chromium. Nine months exposure at Kure Beach. (Original magnification 200 X.)
B. Circular crack on bright nickel A with chromium. Nine months exposure at Kure Beach. (Original magnification 200 X.)

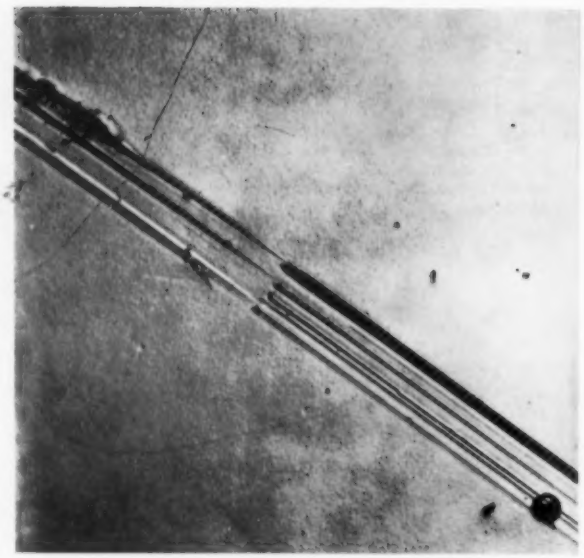

Fig. 8. Scratched chromium surface. Pit on scratch at lower right and spreading of scratch at upper left appeared after 12 days exposure at Bayonne. No other corrosion attack of the coating was evident. (Original magnification 400 X.)

Cracks were also found in the chromium-plated bright nickels. These cracks were always associated with pits as shown in the micrographs of Fig. 7. By parallel sectioning of these cracks, it was found that they extended through the nickel coating to the basis metal; but no evidence was found of corrosion of the steel at the base of the crack except at a few isolated points, although the associated pit contained rust.

EXAMINATION OF SPECIMENS DURING OUTDOOR EXPOSURE

Consideration of the failures mentioned in the preceding section leads to the question of how these failures developed during the earlier stages of the corrosion process and of what defects were originally present in the coating that would lead

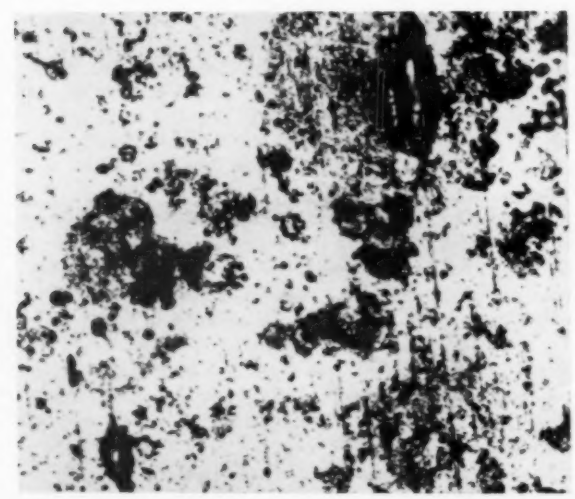

Fig. 9. Bright nickel surface (without chromium) exposed at Kure Beach. Corrosion was more severe along scratches. (Original magnification 400 X.)

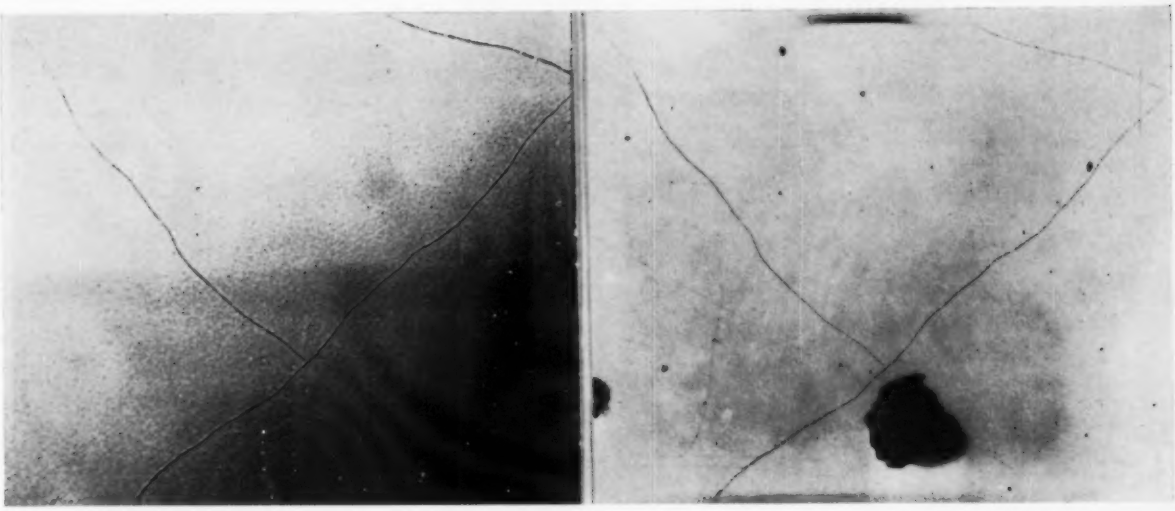

Fig. 10. Surface of chromium plated bright nickel A illustrating "cracks," which did not change in appearance during 74 days exposure at Bayonne or 143 days exposure at Kure Beach. (Original magnification 400 ×.)

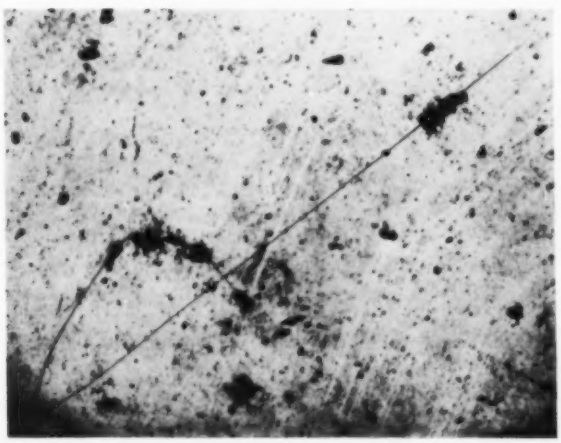

Fig. 11. Crack found on bright nickel A with chromium after 100 days of exposure. Micrograph was taken after 140 days of exposure.

to these failures. It was possible to obtain four panels plated with bright nickel A, two of which were with chromium, and two without chromium, which had been plated under conditions similar to the original panels, but were not necessarily identical. One panel from each pair was exposed at Bayonne and at Kure Beach. These specimens were examined microscopically before exposure and after various intervals ranging from three days to three weeks.

The original examination revealed some accidental scratches which subsequently led to corrosion of the nickel before any other corrosion was observed (Figs. 8 and 9). Also observed were a few fine lines or "cracks" in the chromium surface such as shown in Figure 10. These appeared distinctly different from the cracks mentioned earlier and shown in Fig. 7. During the 11 weeks of exposure at Bayonne and 20 weeks at Kure Beach no corrosion or pitting was evident at these "cracks."

The microscopic exploration revealed no other defects in the as received coatings to which subsequent pitting or cracking could be attributed with any reasonable degree of assur-

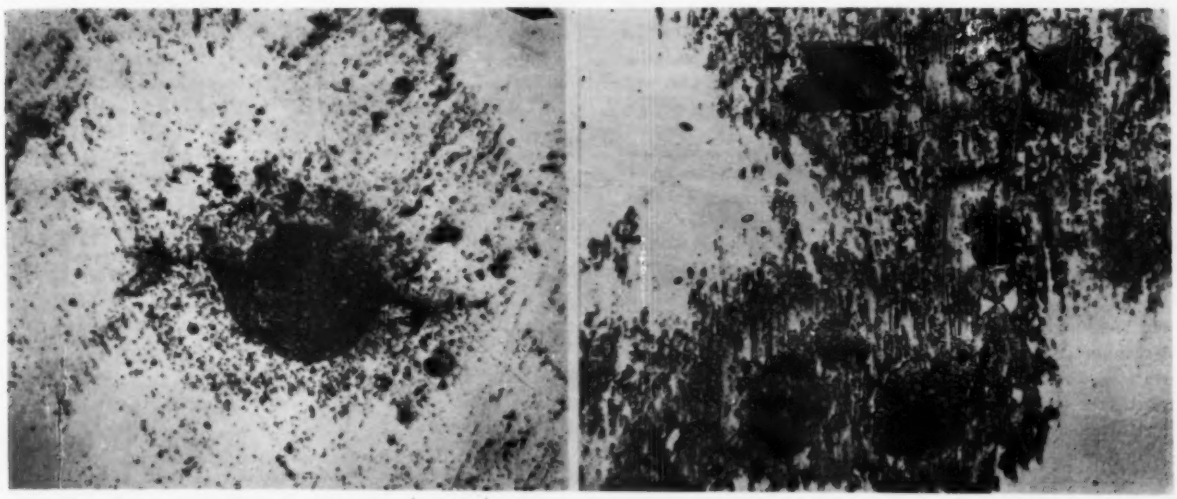

Fig. 12. Chromium plated bright nickel exposed at Bayonne for 61 days (left) and 36 days (right). Large black areas are pits. Debris from atmosphere has not been removed. (Original magnification 400 ×.)

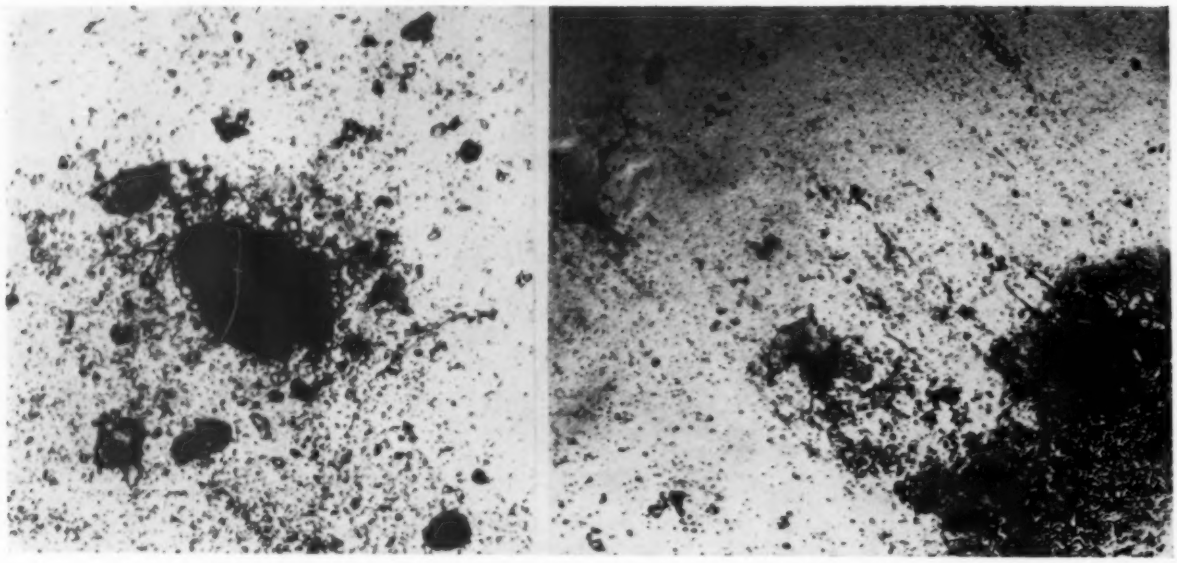

Fig. 13. Chromium plated bright nickel exposed at Kure Beach for 120 days (left) and 80 days (right). Large black areas are pits. Debris from atmosphere has not been removed. (Original magnification 400 ×.)

ance. During the outdoor exposures, pits developed and grew with time and ultimately became rust spots. It was noted that the first rust spots did not appear until the measured depths of the deepest pits approximated the coating thickness. This seemingly obvious observation is mentioned because rust spots have often been attributed to initial porosity as opposed to pitting. Actually rust spots may be attributed to both initial porosity and pitting corrosion of the coating.

Also of interest was the appearance, in the chromium-plated samples, of cracks and associated pits similar to those found on the original set of specimens and shown in Fig. 7A. These cracks (Fig. 11) did not become visible until the pits were well developed, and each crack was associated with a pit.

The discussion in the previous section mentioned, indirectly, differences in pits and rust spots depending on the exposure atmosphere. After the nine months exposure, crow's-feet were quite prevalent on the chromium plated bright nickels exposed at Bayonne, but not at Kure Beach. During the early stages of corrosion of the set of four specimens, however, no such differences appeared. At both locations, the pits developed similarly and looked the same (Figs. 12 and 13). More will be said about this in the following paragraphs.

GALVANIC CORROSION

Concurrently with the examination of the corroding specimens, an exploratory study was made of galvanic couples, such as might be encountered during the corrosion of nickel and chromium plated steel. For many of the experiments, but not all of them, a cell was used such as shown diagrammatically in Fig. 14. Static and dynamic electrode potentials were measured with a calomel electrode and a conventional potentiometer circuit. Short circuit currents were measured with a zero resistance ammeter circuit (Fig. 15). Numerous electrolytes were used in a stagnant condition, without any effort to control the oxygen content. Such measurements are not highly reproducible because the currents change with time. However, they do produce useful information. Three of the observations made are of especial significance to the pitting corrosion discussed in this paper.

1. When Watts nickel was coupled with steel in sodium chloride solutions, the steel was the anode. In an acidic sodium sulfite solution, however, the nickel became the anode. Assuming these electrolytes are representative of the electrolytes encountered in sea coast and industrial atmospheres, respectively, the observations suggest that galvanic effects are responsible for differences in pitting characteristics. After a pit in the nickel has reached the underlying steel, subsequent corrosion will be greatly influenced by the electrolyte. At Kure Beach one would expect the steel to be the anode and this agrees with the relatively rapid rate of rust formation frequently observed. One would expect the steel to be much less anodic or even cathodic to the nickel at Bayonne. This would be in conformity with the observed slower rate of rust formation in the pits and the lateral corrosion of the nickel to produce the crow's-feet. The actual shape of the crow's-foot is probably attributable to the manner in which the chromium layer breaks off as it is undercut by corrosion of the nickel.

2. Nickel and chromium were coupled together in a number of different solutions such as sodium chloride, sodium sulfate, sodium nitrite, sulfurous acid, and sulfuric acid, each at various *p*H values. Usually the chromium was the anode. Nickel was anodic occasionally, but not consistently in any given solution. The inconsistencies may be attributed to the oxygen content of the electrolytes or to the surface condition

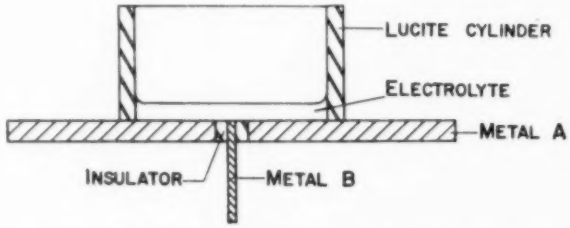

Fig. 14. Cell used for measuring galvanic effects. (Side view.) Wire or brad of Metal B is inserted in hole drilled in center of disk of Metal A. Space between two metals is filled with an insulating material. Metal A may be sheet steel plated with another metal.

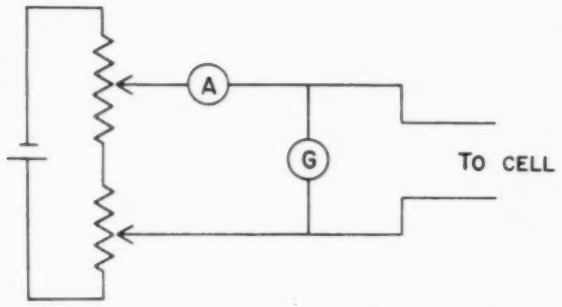

Fig. 15. Zero resistance ammeter circuit. When the potentiometers are adjusted so that there is no deflection of the galvanometer, the ammeter gives the short circuit current flowing through the cell.

of the metals, neither of which were kept under control. The point of significance here is that the commonly accepted view of chromium being cathodic to electrodeposited nickel* cannot be accepted without reservations. It is unquestionable that atmospheric exposure of nickel-chromium coatings results in chemical attack of the nickel and no visibly evident attack of the chromium. The laboratory experiments indicated, however, that it cannot be assumed that the nickel is always the anode.

3. The short-circuit current between Watts nickel and bright nickel (addition agent: benzene disulfonate) in several of the common electrolytes was always considerably greater than between chromium and either type of nickel. This indicates that the galvanic effects between two types of nickel can be appreciable and supports the explanation usually given for the performance of double-layer nickel coatings.

DISCUSSION

Because of climatic variations and uncontrolled features of plating processes, the reproducibility of exposure tests is poor. This, along with the very limited scope of the observations reported here, precludes any firm conclusions other than that much is to be learned about the corrosion process of plated coatings by more detailed and careful examination of corroding specimens. The reported observations do contribute to the overall knowledge of the subject and suggest conclusions which need to be confirmed by more extensive observations.

With the help of these observations, one can build up the following generalized picture of the corrosion process. This picture serves only to put some facts in an orderly scheme and is expected to be altered as more facts are brought to light.

The decorative chromium coating is assumed to be porous in the "as plated" condition and to be essentially immune to chemical attack by the atmosphere. Initial corrosion occurs through the minute pores in the chromium. Thus, pitting of the nickel is started and as the pits grow downward and outwards, the chromium is undercut and broken off at the edges by mechanical forces, leaving a larger hole in the chromium and allowing more extensive corrosion of the nickel.

The number of pits is determined primarily by the porosity of the chromium, and, at least from our limited observations, is greater for chromium plated over buffed Watts nickel than over bright nickel. The rate of attack of the nickel is, of course, determined by the environment and, because of the galvanic cell created by the chromium covering the nickel, the nickel corrodes somewhat more rapidly than it would in the absence of chromium. (Nickel exposed by discontinuities in the chromium generally corrodes more rapidly than the general surface of the same nickel without chromium.) The rate may also be related to the ratio of the anode to cathode area of the chromium-nickel cell. If so, an inverse relation between the number of pits per unit area and the rate of pit growth can be expected.

The pits continue to grow laterally and vertically, eventually exposing the basis metal. (Where initial porosity of the nickel coating exists, this corrosion process will be by-passed.) The nature of subsequent corrosion depends to a large extent on the basis metal and on the atmosphere or electrolyte present. If the basis metal is steel and the electrolyte is such that the steel is anodic and the electrical currents are quite pronounced, corrosion of the nickel is retarded and rust forms rapidly, filling up the pits and exuding over the chromium surface. If rust formation continues, the nickel layer is undercut and may be broken off by mechanical forces, thus enlarging the pit. In an industrial atmosphere, the electrolyte may be such that the steel is much less anodic or even cathodic to the nickel and the electrical currents are relatively weak. Under such conditions, the steel corrodes relatively slowly and the nickel may corrode more rapidly; rust formation is retarded and lateral growth of the pits proceeds by corrosion of the nickel. As the chromium is undercut, it breaks off in a pattern determined by its structure and stress pattern. This leads to the odd shapes such as stars or crow's-feet that have been observed on many occasions.

This picture does not include any cracks in the nickel such as mentioned earlier. While they did not seem to contribute significantly to the appearance and failure of the coating, it is quite possible that they would play a more important role after longer exposures.

The shapes of a number of the pits in the nickel coatings without chromium are reminiscent of the etch pits commonly associated with dislocations. The similarity is sometimes quite pronounced and suggests that corrosion of the electrodeposited nickel is influenced by grain structure as well as by factors external to the grains.

*H. Brown, M. Weinberg, and R. J. Clauss, PLATING **45**, 144 (1958).

Donald W. Ernst received a PhD in inorganic chemistry and physical metallurgy from the University of Wisconsin in 1956, and then served as research associate for Project 13 at the National Bureau of Standards until January 1960 when he joined the staff of the Naval Ordnance Laboratory. Dr. Ernst is a member of AES, ACS, ASM, The Electrochemical Society, Phi Lambda Upsilon, and Sigma Xi.

Fielding Ogburn received a BS degree in 1941 from the University of Chicago, and is the assistant chief, Electrodeposition Section of the National Bureau of Standards. Mr. Ogburn is a member of the ACS; ASTM, serving as chairman, Subcommittee 1, Committee B-8; past chairman, Washington-Baltimore Section, Electrochemical Society. He is a Delegate and has served as Alternate Delegate, Secretary, Librarian and President of the Baltimore-Washington Branch, AES. Mr. Ogburn was Project Director of AES Research Project 13 until its termination in 1960. Currently he is Director of Project 19.

SHOP BULLETIN F60-17
Discontinuation
Polishing & Buffing Operations
August 8, 1960
Effective immediately all polishing and buffing operations on AMES MAID items, prior to plating, are to be discontinued.
C.D. Memel

Ames said goodbye completely to polishing and buffing when SUPERLUME came along

Ray Schlotterbeck exhibits a few Ames products plated with Superlume. Above him, another testimonial to Superlume's superiority . . . Shop Bulletin F60-17.

Reports RAY SCHLOTTERBECK,
Plating Superintendent for the world's largest maker of Shovels and Garden Tools (since 1774), as well as famous AMES MAID and AMES AIRE Tubular Furniture.

One month after Superlume bright nickel bath went into operation at O. Ames Company, Parkersburg, W. Va., the official bulletin shown declared *all* polishing and buffing there no longer necessary.

Ames had been polishing 5000-6500 parts a day, first switched to Superlume just to give its products added eye-appeal. When Superlume produced a greater depth of color *without* polishing than previous baths gave *with*, Ames got a tremendous bonus: *A reduction in its over-all finishing costs of 10 to 12%.*

"I never saw a bath that levels better," says Ray Schlotterbeck, "nor one that throws or brightens better, either." And Ames sales people add, "Our product quality was never higher."

Results like these are common with Superlume. Ask H-VW-M for full details.

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the Brighter Zinc Brightener

ROHCO® 503

• Degrees Brighter • Uniform Coverage • Greater Throwing Power

• Speeds Zinc Plating • More Stability • Goes Farther

• Cuts Costs, Boosts Quality in still and barrel plating

Reports from platers everywhere claim ROHCO 503 Zinc Brightener tops them all for performance. Brings your zinc plating to an all-time high of optimum quality. Better coverage and throwing power for even the most complex shapes. High-concentrate, liquid ROHCO 503 produces chrome-like brightness at only ½% over the cost of ordinary zinc plating. Practically pays for itself in lowering operating costs alone. Unsurpassed as a combination brightener for both still and barrel plating—does job of two ordinary brighteners. By every performance standard, ROHCO 503 is today's most effective, economical and easy-to-use brightener of its type. Call your ROHCO Representative.

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ROHCO 20 XL and Super XL: World's leading cadmium brighteners.

ROHCO Cad-Sol: Add water for instant cadmium plating bath.

ZINC PLATING PRODUCTS

ROHCO 100 and ROHCO 102: Barrel zinc brighteners for brilliant, blue-white deposits.

Econobrite: Economical, bright deposits, suitable for post-plating dip.

Perma-Brites: Uniform, commercial finishes at lowest cost.

ROHCO 503: Most popular zinc brightener in plating.

ROHCO Zinc Purifier: Purges zinc plating baths — saves brightener.

ROHCO Zinc Sol: Add water for instant zinc plating bath.

ROHCO ZW-600: Wetting agent for more efficient, cleaner zinc plating.

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Rodips CD-3, CD-4, CZ-10, and Roblack for cadmium: Superior post-plating treatments for passivating and coloring cadmium plate.

Rodips ZN-22, ZN-23, ZN-25, ZN-30, etc., for zinc: Superior post-plating treatments for passivating and coloring zinc plate.

Rodip AL-50 for aluminum: Superior chromate treatment imparts corrosion protection to aluminum and its alloys.

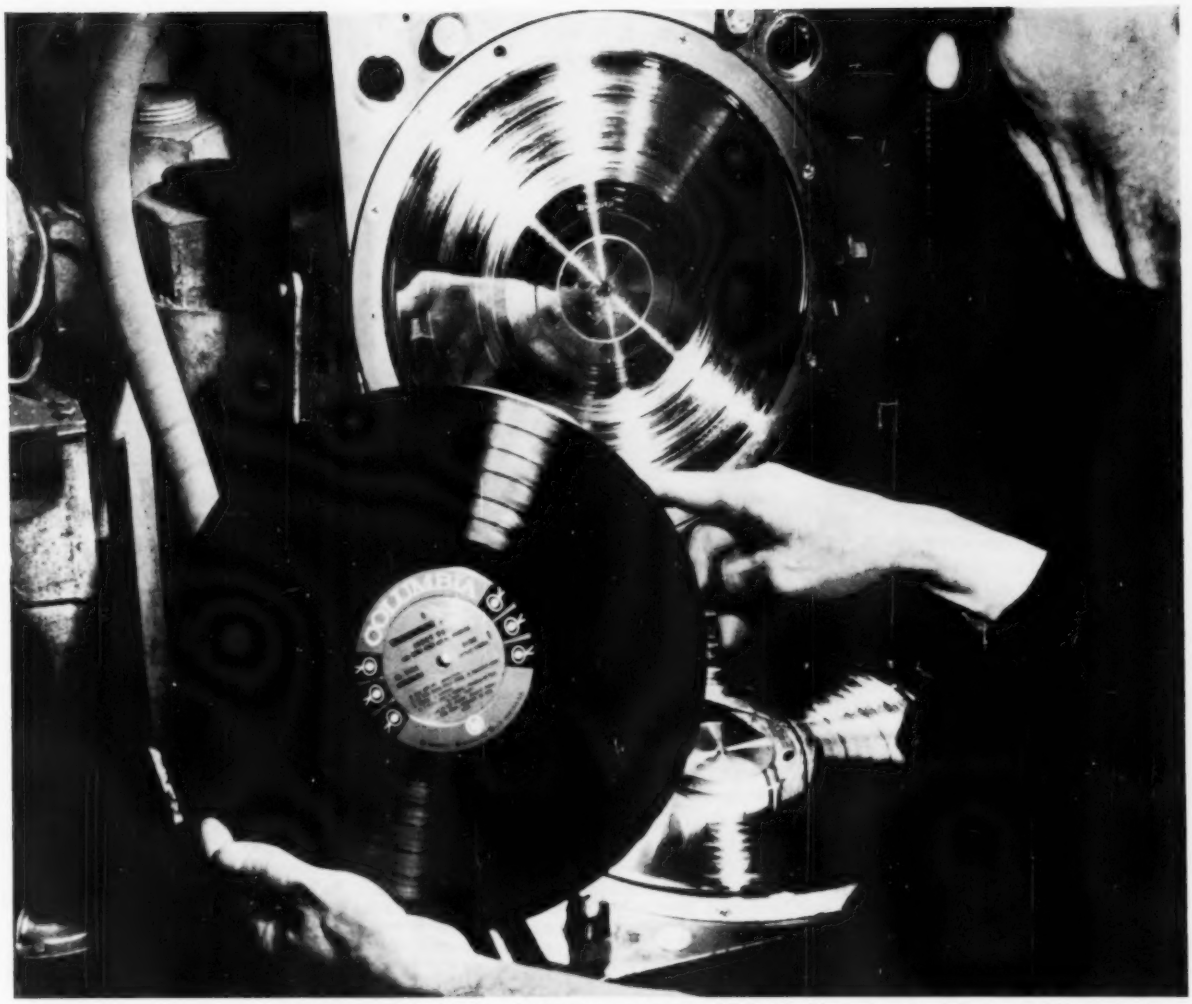
OTHER ROHCO PRODUCTS

ROHCO Super No-Cro-Mist and ROHCO Anti-Spray: Spray suppressants for chromium plating baths.

ROHCO Rins-Aid: Water shedder; improves drying, prevents staining.

Rodip AL-44: Improves aluminum brite dips.

Hull Cells, Rectifiers and Related Plating Test Equipment: Wide range of models for every purpose and convenience.



Moulds made entirely of Barrett Sulfamate Nickel. Photo courtesy Columbia Records, Inc.

making nickel talk

Sooner or later a good idea comes along in a business and makes a better product. It does the job well and in the long run saves the buyer money. It breaks through old concepts. It helps make successful operations out of the companies that buy the product and the company that makes the product. Sooner or later it happens in every business, just as it happened in the industry that makes record stampers. The idea was Barrett Sulfamate Nickel Plating. Not a decorative nickel (they're good and have their place) but an engineered, stress-free, ductile nickel that's purified and ready-to-operate. The process saves time. It's easy to maintain and control. Deposits pure nickel, free from stress, which often causes cracking, warping, peeling, and premature fatigue failure. It allows part forming after plating and protects against high temperatures. No wonder that the record stamping industry has used Barrett Sulfamate Nickel since Barrett first made it available. No wonder that when they talk nickel (or make nickel talk) they talk Barrett Sulfamate. They know that Barrett and sulfamate technology are synonymous.

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Shelton, Connecticut

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TORONTO BRANCH'S LARGE-SCALE, MIDWEEK FULL-DAY EDUCATIONAL MEETING CITED

Unique in that it drew and held a quality audience of over 200 AES members and guests on a midweek full-day, the "Metal Finishing Symposium" of the Society's Toronto Branch was conducted at the Seaway Hotel of that Canadian municipality, Tuesday, March 28 and was practically unanimously acclaimed as one of the current AES season's outstanding Branch educational events. Herbert A. Skelton, International Nickel Company, served as General Chairman.

Opened before a capacity audience by Branch President Gordon A. Lince, the Morning Session over which M. H. Jones, Ontario Research Foundation presided, heard, in succession, Cleveland F. Nixon, General Motors Corp., ("Decorative Plating in the Automotive Industry"); Clarence H. Sample, International Nickel Company ("Corrosion Behavior and Protective Value of Nickel Chromium Coatings on Steel") and F. A. Sweet, Canadian Standards Association ("Standardization in Industry—How Standards Pay Off").

The Luncheon Session heard W. H. Evans, President of Honeywell Controls Limited present "Buy Canadian." It also heard National AES President W. Andrew Wesley. General Chairman Skelton presided.

A. Granik, General Motors Corporation, served as Afternoon Session Chairman. The session featured Dr. A. E. Berry, Ontario Water Resources ("Industrial Metal Finishing Waste Control in Ontario"); Dr. A. Kenneth Graham of Graham, Savage & Associates, Inc. ("Disposal of Plating Room Wastes") and National Executive Secretary John P. Nichols on the international educational affairs of AES.

That evening, a delightful dinner was tendered at the City's handsome Granite Club by the Toronto Branch to AES National and Branch Officers, to the Symposium's Speakers and Sessions Chairmen and to several distinguished guests. General Chairman Skelton served as Toastmaster. Principal speakers were National President Wesley, Executive Secretary Nichols and Branch President Lince.

The "Metal Finishing Symposium" observed the Toronto Branch's 49th Anniversary as a chartered Branch of the AES and, in effect, served as forerunner of its GOLDEN JUBILEE that will be celebrated in 1962.

Committee stalwarts who helped Chairman Skelton in fashioning the cited March 28 event included A. Adams and D. Hanna, Speakers Arrangements; R. Day, Function Arrangements; M. Green, G. Lince and A. Patterson, Publicity and Marshall Darbyshire, Registration.

BOB WETTSTEIN ELECTED ASSOCIATION HEAD

PLATING MAGAZINE happily congratulates its Western Advertising Representative, Bob Wettstein, upon his recent election as President of the Magazine Representatives Association of Southern California. Head of Wettstein, Nowell & Johnson, Inc., with offices in Los Angeles, San Francisco and Portland, he has represented PLATING in ten Western States since June 1957. During his tenure, he also was awarded the "Space Buyer's Gold Medal" for being voted among the "Top Ten" Publishers' Representatives performing the greatest service to their publishers and advertising agencies on the West Coast.

(Top left) Luncheon between sessions of the Metal Finishing Symposium of the Toronto Branch. At head table in background, l to r, Dr. A. Kenneth Graham, Afternoon Technical Chairman A. Granik, National Executive Secretary John P. Nichols, Branch President G. Lince, M. Green, W. H. Evans, General Chairman H. A. Skelton, National President W. Andrew Wesley, Clarence H. Sample, Morning Session Technical Chairman M. H. Jones, Cleveland F. Nixon and F. A. Sweet. (Top right) President Wesley speaks at dinner at the Granite Club. L to r, Messrs. Sample, D. Hanna, Skelton, Wesley, Lince and Nichols. (Bottom left and right) Views of the audiences at the Technical Sessions.

Photographs courtesy of Brock Laws, Toronto Branch

AES NEWS

SAN DIEGO BRANCH CHARTERED AS AES'S SIXTIETH BRANCH

The provisional San Diego (California) Branch's application for Permanent Charter was recently approved by the Executive Board, and consequently that Branch has become the 60th chartered Branch of American Electroplaters' Society, Inc. (AES) effective April 1, 1961.

Temporarily chartered November 1, 1960, the AES's neophyte San Diego Branch demonstrated its mettle during its prescribed probationary period by swelling its membership to some 25 members in good standing, with many more additions in the offing, and by the quality of its performance in other Branch ways.

It will formally be installed by a team of National Officers in behalf of the Executive Board at a gala installation to occur in nearby Coronado, May 20, 1961. There, it will receive its charter, and its first group of elected Branch officers will formally be indoctrinated and installed.

CURRENT AES SPEAKERS LIST SPEEDING TO BRANCHES

Created for the third consecutive year singlehandedly by Rafael Diaz, Chairman of the Speakers List Subcommittee of the AES's Educational Committee, the Society's Speakers List (1960–1961 Edition) has been completed in record time. Copies have been speeded by National Headquarters to the Society's Branch Educational Chairmen, Branch Secretaries and others significantly concerned with programming Branch Educational Meetings.

The voluminous edition prepared by Mr. Diaz, a stalwart of the Pittsburgh Branch, not only identifies numerous qualified speakers on various electroplating, metal finishing and allied arts subjects of likely interest to AES's chartered Branches, but also embodies abstracts of the respective titles for easier identification and appraisal by responsible Branch speaker programmers.

CORRECTION

In the AES's documentary booklet "Milestones of AES," and in the chart titled "Kaleidoscope of AES's First Half Century" that is the mainstay of that document, the permanent chartering date of the Society's Houston Branch is reported as 1954. The Branch received its permanent charter in 1951. AES and the author regret this inadvertence.

EDITORIAL BOARD FINALIZES BOSTON CONVENTION'S VERSATILE EDUCATIONAL PROGRAM

The Educational Sessions Program of the 48th Annual Convention of American Electroplaters' Society, Inc. (AES) tentatively approved by the Editorial Board of AES at its December 1960 meeting was critically scrutinized by that responsible Board, session-by-session and paper-by-paper, at its full-day meeting held at the Hotel Tuller, Detroit, Michigan, Friday, April 7, 1961, and was finalized with a resultant attrition of some three technical papers. Including three other technical papers passed provisionally subject to further critical appraisal by appointed Board "reviewers", that well-balanced final program as approved and released by the Board is spread on Pages 511–514 of this May 1961 issue of PLATING MAGAZINE.

That Educational Program that will feature the Society's heralded 1961 Annual Convention will lead off in the Grand Ballroom of Boston's Statler-Hilton Hotel, Monday afternoon, June 19, 1961 with the third annual "William Blum Lecture", this to be delivered by Dr. Charles L. Faust, Battelle Memorial Institute and 1959–1960 winner of the "AES Scientific Achievement Award". It is titled, "The Challenge Before Us", Dr. William Blum himself will serve as Session Chairman.

Another high-spot of that versatile program will be the "Finishing of Light Metals Symposium" to occur Tuesday, June 20. Presenting four papers on "Finishing of Aluminum", two papers on "Finishing of Magnesium" and two papers on "Finishing of Beryllium", the morning session will be moderated by Dr. Gerald H. Kissin of Kaiser Aluminum and Chemical Corporation — the afternoon session by Charles Levy of the Gillette Safety Razor Company. A "Finishing of Light Metals Forum" will conclude that eventful day.

Still another feature will be the "Research Session" to take place immediately following Monday's "William Blum Lecture." Leading off with an evaluation of the AES's 1960–1961 Research Program by Dr. D. G. Foulke, Chairman of the AES Research Committee, he will be followed by two widely anticipated papers of that vital Program, namely Project No. 14 (Chromium Plating) to be presented by Dr. M. H. Jones of the Ontario Research Foundation, and Project No. 15 (Corrosion Tests) to be delivered by AES Past President Walter L. Pinner, Chairman of that Project.

Among the six additional half-day sessions themselves embodying an aggregate of 15 technical papers to be heard on other phases of electroplating, metal finishing and allied arts, will be an "Organic Coating Session."

Aside from finalizing and releasing the 1961 Boston Convention Educational Program created under its direct supervision by the Boston Branch's able Educational Committee led by Host Branch Educational Chairman George J. Marotta and his Co-Chairman Charles Levy, with Dr. G. H. Kissin in charge of the Symposium, the Editorial Board also continued its preliminary work on the 1962 Milwaukee Convention Educational Program. Present at the Detroit meeting and spearheading the discussion was Educational Chairman Joseph Andrus of that 1962 Convention Committee.

The Editorial Board's full-day Friday meeting was preceded by an evening session held at the Statler-Hilton Hotel, Thursday evening, April 6. With Board Chairman John P. Nichols presiding, the Board not only engaged in a full-evening's penetrating long-range planning but also unanimously adopted, for Executive Board consideration and ratification, a statement titled, "General Policy Governing Discussion Periods of Educational Sessions of AES's Annual Conventions."

Present at both days' Editorial Board sessions besides Board Chairman Nichols and Secretary Rodney Leeds were Board members Dr. Henry Brown, Robert A. Ehrhardt, James H. Lindsay, George J. Marotta, Gerald A. Lux, Edward E. Oberland, William H. Safranek and Dr. Edward B. Saubestre. Present by invitation were Joseph Andrus and Dr. Gerald H. Kissin.

Editorial Board finalizing the Boston Convention Educational Program. Clockwise from nearest to camera at left, Robert A. Ehrhardt, Dr. Henry Brown, Editorial Board Chairman John P. Nichols, Edward E. Oberland, George J. Marotta, Dr. Edward B. Saubestre, Dr. Gerald H. Kissin, Joseph Andrus, Gerald A. Lux, James H. Lindsay.

CONSTITUTION AND BYLAW AMENDMENTS PROPOSED BY EXECUTIVE BOARD TO SUPREME SOCIETY

(Notice thereof in conformity with Part III, Article I, Section 3 of the Constitution of American Electroplaters' Society, Inc.)

SO AS to balance the annual income and expense of American Electroplaters' Society, Inc. (AES) without further foreseeable need for operating subsidy from AES reserves under today's economic conditions, the Executive Board, for the Society's financial safety, proposes for consideration of the Supreme Society, AES's summit governing council, at its Annual Meeting to be held in Boston, June 22, 1961, the Constitutional and Bylaws amendments that are spread below, as certified by the Law Committee.

They provide for an increase in the annual Per Capita Tax paid by Branches, and the annual dues of Members-at-Large, these increases to become effective on July 1, 1962 for the fiscal year spanning July 1, 1962-June 30, 1963, and thereafter.

In addition, the Executive Board is proposing the other Bylaw amendments that also follow:

CONSTITUTION

PART I, ARTICLE V, SECTION 2

NOW READS: "(a) The minimum annual dues of Active Members of North American Branches shall be ten dollars and eighty cents. Those of Active Members of Branches not in continental North America shall be nine dollars. (b) One dollar of the annual dues of each such Active Member shall be used to support research. (c) The minimum annual dues of Student Members shall be five dollars. (d) The minimum annual dues of Sustaining Members shall be one hundred dollars and shall be paid to the Executive Secretary. (e) The dues of Members-at-Large shall be eleven dollars and shall be paid to the Executive Secretary. (f) Honorary Members shall be exempt from payment of dues."

CHANGE $10.80 to $14.80; $9 to $10.30; $11 to $15.00.

♦

PART I, ARTICLE V, SECTION 3

NOW READS: "(a) From the annual dues of each Active Member of a North American Branch there shall be paid to the Supreme Society, a Per Capita Tax of seven dollars and fifty cents ($7.50). From the annual dues of each Active Member of a Branch not in continental North America, there shall be paid to the Supreme Society a Per Capita Tax of five dollars and seventy cents ($5.70). (b) Of the Per Capita Tax of each such Active Branch Member two dollars ($2.00) shall be used to pay the annual subscription to the official journal of the Society and one dollar ($1.00) shall be paid into the Research Fund. (c) From the annual dues of each Sustaining Member there shall be paid to the Supreme Society, a Per Capita Tax of four dollars and seventy cents ($4.70), of which two dollars ($2.00) shall be used to pay the annual subscription to the official journal of the Society."

CHANGE: $7.50 to $11.50; $5.70 to $7.00.

BYLAWS

PART I, ARTICLE V, SECTION 3

NOW READS: "From the annual dues there shall be paid a Per Capita Tax of seven dollars and fifty cents ($7.50) for each Active Member in good standing of a North American Branch and of five dollars and seventy cents ($5.70) for each such member of a Branch not in continental North America . . ."

CHANGE: $7.50 to $11.50; $5.70 to $7.00.

♦

PART I, ARTICLE V, SECTION 1

NOW READS: "Dues shall be paid in advance for the fiscal year and are payable on the first of July. Dues are payable annually in one installment, except that a member elected during the fiscal year shall pay only for the complete quarters remaining of that year."

CHANGE SECOND SENTENCE TO READ: "Dues are payable annually in one installment. A member elected during the fiscal year shall pay for the quarters remaining of that fiscal year, including that in which elected."

♦

PART I, ARTICLE V, SECTION 3

NOW READS: ". . . The (Per Capita) tax shall be paid annually, not later than the first day of September; except that for each new member of a Branch there shall be paid upon his election a tax proportionate to the number of complete quarters remaining of the fiscal year . . ."

CHANGE LAST PART OF SENTENCE TO READ: ". . . there shall be paid upon his election a tax proportionate to the number of quarters remaining of the fiscal year, including that in which elected . . ."

PART I, ARTICLE III, SECTION 13

NOW READS: ". . . This Committee shall collect and review all material published by the Society to determine that which should be published in book form . . ."

CHANGE TO READ: ". . . The Publications Committee shall study and select subjects relative to the interests of the membership of the Society, and consonant with its aims which are of sufficient magnitude and timely interest to justify publication in book form. It shall recommend to the Executive Board, ways and means of collecting material for such books and upon Executive Board approval shall select and assist the editor and author thereof."

♦

PART II, ARTICLE IV, SECTION 1

NOW READS: "The Officers of a Branch shall be President, First Vice President, Second Vice President, Secretary, Treasurer (or Secretary-Treasurer), Librarian, and the three or more members of the Board of Managers."

CHANGE title "Librarian" to "Branch Educational Chairman."

♦

PART II, ARTICLE V, SECTION 6

NOW READS: "The Librarian shall provide for suitable topics of discussion, speakers, and paper for the meetings of the Branch. He shall have charge of the Question Box and of all magazines, books, and similar property of the Branch. He shall ordinarily be a representative of the Educational Committee of the Society."

CHANGE title "Librarian", wherever used, to "Branch Educational Chairman."

♦

PART II, ARTICLE VIII, SECTION 1

NOW READS: "The minimum annual dues of Active Members of North American Branches shall be ten dollars and eighty cents ($10.80) and of Branches not in continental North America nine dollars ($9.00). The minimum annual dues of Student Members shall be five dollars . . ."

CHANGE $10.80 to $14.80 and $9.00 to $10.30.

♦

PART II, ARTICLE VIII, SECTION 1

NOW READS: ". . . New members shall on election pay dues for the complete quarters remaining of the fiscal year during which they are elected."

CHANGE TO READ: ". . . New Members shall on election pay dues for the number of quarters remaining in the fiscal year, including those in which they are elected."

ROCHESTER BRANCH FIFTIETH ANNIVERSARY PROCLAIMED

Proclaimed by Rochester's Mayor Peter Barry as "American Electroplaters' Society Week in Rochester", the two-day span, May 5–6, 1961, will climax the AES Rochester Branch's GOLDEN JUBILEE observance as a chartered Branch of the Society, with the impressive Seventh Annual Empire State Regional Meeting.

With the Manger Hotel of that municipality as site, and the half-century old Rochester Branch as host, the event is being conducted in collaboration with the five other AES Branches of that region, namely Buffalo, Capitol District, Mohawk Valley, Southern Tier and Syracuse.

The Society and its PLATING MAGAZINE extend hearty Anniversary greetings to its Rochester Branch.

A. C. Fricke

NOTED AES TEXAN, A. C. FRICKE, DECEASED

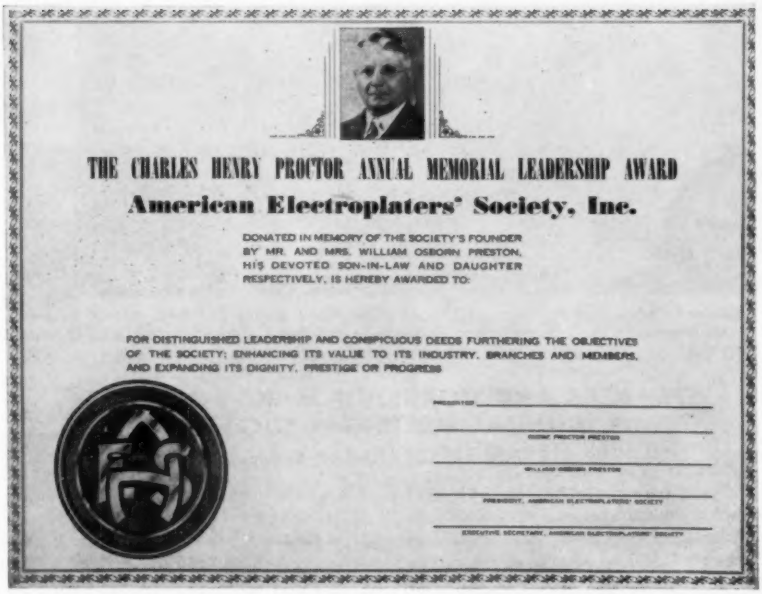
The Society has been saddened by the sudden death on March 27, 1961 of A. C. Fricke of Dallas, Texas, long-time Secretary-Treasurer of its Dallas-Fort Worth Branch.

A Dallas resident for 44 years, head of the A. C. Fricke Company of that municipality and widely known and respected in electroplating and metal finishing circles, Mr. Fricke, 63 years of age, was a Founding Father of the AES's Dallas-Fort Worth Branch and one of that Branch's most dedicated and articulate accredited Delegates.

Only last Autumn, he was awarded that Branch's first annual "Dallas-Fort Worth Branch Achievement Award."

Born in Clifton, Texas, the deceased was a member of the Board of Stewards of the Oak Cliff Methodist Church. He was a veteran of World War I and a stalwart of the American Legion. He is survived by his wife, two brothers and three sisters.

The Society and its PLATING MAGAZINE extend deepest sympathy to the wife and family of the deceased—and, of course, to his Branch over its great loss.


THE CHARLES HENRY PROCTOR ANNUAL MEMORIAL LEADERSHIP AWARD
American Electroplaters' Society, Inc.
DONATED IN MEMORY OF THE SOCIETY'S FOUNDER
BY MR. AND MRS. WILLIAM OSBORN PRESTON,
HIS DEVOTED SON-IN-LAW AND DAUGHTER
RESPECTIVELY, IS HEREBY AWARDED TO:
FOR DISTINGUISHED LEADERSHIP AND CONSPICUOUS DEEDS FURTHERING THE OBJECTIVES
OF THE SOCIETY; ENHANCING ITS VALUE TO ITS INDUSTRY, BRANCHES AND MEMBERS,
AND EXPANDING ITS DIGNITY, PRESTIGE OR PROGRESS

PROCTOR AWARD COMMITTEE APPRAISING AES BRANCH AND COMMITTEE NOMINATIONS

By April 1 deadline, a number of nominations had arrived at National Headquarters from respective AES Branches, Boards and Committees entering into contention for this year's Charles Henry Proctor Memorial Leadership Award, the respective deeds in behalf of AES of nominees of those respective bodies. These nominations have now, in turn, gone, for consideration and action, to the Charles Henry Proctor Memorial Leadership Selection Committee.

The 1960–1961 winner of that summit AES annual administrative honor donated by Mr. and Mrs. William Osborn Preston, son-in-law and daughter respectively of the late C. H. Proctor, Founder-First President of the Society, will be announced at the Farewell Banquet of the 48th Annual Convention, Boston, June 22. He will not only receive a $150 cash award but also a handsome, laminated scroll, a photographed copy of which is shown above.

Besides the donors and National President W. Andrew Wesley, its Chairman, this year's Selection Committee is composed of National Executive Secretary John P. Nichols; Research Committee Chairman D. Gardner Foulke; Order of Past Presidents Chairman Samuel S. Johnston; Syracuse Branch President William M. Robinson and Kansas City Branch President Warren B. Eliot.

AES EXTENDS COMMENDATION TO RETIRING COMMITTEE MEMBERS

The following are the Society's stalwarts whose terms on AES Standing Boards and Committees expire at the First Business Session of the Supreme Society to be held at the 48th Annual Convention, Monday, June 19, 1961, Boston, Massachusetts:

1. EDITORIAL BOARD: Robert A. Ehrhardt; James H. Lindsay; William H. Safranek and George J. Marotta
2. EDUCATIONAL: Rafael Diaz; Dr. John Kane and William P. Wisdom
3. HONORARY MEMBERSHIP AWARD: Anthony P. Julius and Dr. Samuel Heiman
4. MEMBERSHIP: Irvin M. Weiss, George E. Parisho and M. Lester Reynolds
5. PUBLIC RELATIONS: I. William Marcovitch, Arthur G. Pierdon and Frank Tirendi
6. PUBLICATIONS: Dr. S. Heiman, Dr. Vernon A. Lamb and Dr. Earl J. Serfass
7. RESEARCH: Dr. D. G. Foulke, Raymond L. Mitchell and Walter E. Moline
8. SCIENTIFIC ACHIEVEMENT AWARD: Myron B. Diggin and Dr. Louis Weisberg

The Society extends its deep appreciation to each of these members for meritorious service during his tenure. PLATING MAGAZINE adds its own congratulations.

Rockford Branch President Harold Ellis, at microphone, opens Rockford Annual Educational Meeting. A. T. Leonard and Branch Librarian Bob Campbell, at left; Ezra Blount, far right.

SPEAKERS AND WORKSHOP MAKE ROCKFORD ANNUAL MEETING A SUCCESS

by ALEXANDER ALEXANDER, Rockford Branch

Talks by Ezra Blount and A. T. Leonard keynoted the morning session of the Rockford Annual Educational Meeting held at the Faust Hotel on March 11. A record attendance from both the Host Branch and many neighboring Branches gave proof to the success of the affair. President Harold Ellis, Librarian Bob Campbell as well as all the committee members who assisted on this affair must be commended.

Leading off the morning session was a very interesting talk on "Surface Preparation Prior to Painting" by Ezra Blount, editor of *Products Finishing*, in which he outlined the various accepted methods of surface preparation, their advantages and limitations. While not going into great detail on any specific phase of the subject, Mr. Blount indicated that individual plant conditions and unusual requirements often make for unique practices.

Al Leonard, president of Superior Plating Co., Minneapolis, Minn., and a past president of the National Association of Metal Finishers, spoke on "The Role of the NAMF in the Metal Finishing Industry."

A stag luncheon followed the morning session and allowed for the renewal of old friendships and good fellowship.

The afternoon session continued with the program of workshops as has been the practice of this Branch in the recent years and one which has become the highlight of our meetings. A very strong panel was moderated by Leonard Weeg, recently appointed superintendent of Hardware Division, National Lock Co., who did a yeoman job of handling this very informative and helpful panel consisting of Art Bartman, manager of metallurgical chemistry, Bell & Howell Co., Chicago, Ill., Henry Bornitske, plating foreman for 39 years at Cutler-Hammer, Milwaukee; Chester G. Borlet, technical director of Grand Rapids Brass Co., Grand Rapids, Mich., and National First Vice President of the AES; and Dick Giesel, executive vice president and production manager of Adolph Plating Co., Chicago, Ill.

A Cocktail Party, sponsored by 21 contributing suppliers, preceded the usual Banquet and Dinner Dance which attracted 230 participants who reveled in good fellowship till early morning.

THERMAL CONDUCTIVITY DISPLAY WINS WATERBURY PLAQUE

The plaque that the Waterbury Branch donated for the winner of the Seventh Grade competition at the Swift Junior High School (Watertown) Science Fair was awarded by Frank Tirendi before an assembly of students on April 6, 1961. The winner was Miss Julia Wilson who presented a display on thermal conductivity. This plaque will be on display in the trophy case of the Junior High School.

The Waterbury Branch Lecture Program got off to a good start with its first lecture delivered by Henry Strow before approximately 200 students at the Swift Junior High School in Watertown. Ed Garland is to deliver a similar lecture at Naugatuck High School on April 13, 1961. The purpose of the lectures is to acquaint the students with some of the methods of Electroplating.

BEFORE THE SUPREME SOCIETY

AGENDA
FIRST BUSINESS SESSION

GRAND BALLROOM
STATLER-HILTON HOTEL,
BOSTON, MASSACHUSETTS
MONDAY MORNING, JUNE 19, 1961

I Call to Order, ANNUAL MEETING.
II Roll Call of Officers.
III Report of Credentials Committee.
IV Roll Call of Delegates.
V In Memoriam.
VI Reports of Officers (Published Copies in DELEGATES KITS):
- (a) President
- (b) First Vice President
- (c) Second Vice President
- (d) Third Vice President
- (e) Past President
- (f) Executive Secretary

VII Reports of Standing and Special Committees (Copies in DELEGATES KITS).
VIII Report on New Branches.
IX 1960-1961 Financial Statement and 1961-1962 Budget (Copies in DELEGATES KITS).
X Report of Paper Awards Committee and Presentation of Awards.
XI Announcement of Board Appointments To:
- (a) Editorial Board
- (b) Research Committee
- (c) Public Relations Committee
- (d) Election Committee
- (e) Honorary Membership Awards Committee
- (f) Educational Committee
- (g) Membership Committee
- (h) Publications Committee
- (i) Scientific Achievement Award Committee

XII Presentation, Proposed Revisions, Constitution and Bylaws.
XIII Business Brought for Discussion by Delegates.
XIV Recess of ANNUAL MEETING.

AGENDA
SECOND BUSINESS SESSION

PARLORS A-B-C, STATLER-HILTON HOTEL, BOSTON
THURSDAY, JUNE 22, 1961

I Call to Order, ANNUAL MEETING.
II Roll Call of Officers.
III Roll Call of Delegates.
IV Roll Call of Living Past Presidents.
V Financial Statement (1960-1961) and Proposed Operating Budget (1961-1962):
- (a) Action on Proposed Operating Budget for the 1961-1962 Fiscal Year (July 1-June 30)

VI Action on AES Constitutional and Bylaw Amendments Proposed by the Executive Board
- (a) Increasing the Rate of the Society's Per Capita Tax, Member-at-Large Dues and Minimum Branch Dues, Effective July 1, 1962
- (b) Requiring Per Capita Tax Payment by Branches for New Members Starting With the Quarter During Which Elected
- (c) Altering the Branch Title "Librarian" to "Educational Chairman"
- (d) Broadening the Function of the Publications Committee

VII Report on Membership Competition. Presentation of Branch Awards.
VIII Action on Nominees for AES Honorary Membership.
IX Announcement of Award of Merit Winners.
X Presentation of "Order of Past Presidents Award," if Any.
XI Business Brought for Discussion by Delegates.
XII Discharge of 1960-1961 Special Committees.
XIII Nomination and Election of 1961-1962 Officers:
- (a) President
- (b) First Vice President
- (c) Second Vice President
- (d) Third Vice President

XIV Installation Ceremony:
- (a) Installation of Newly Elected Officers
- (b) Presentation of Gavel to New President
- (c) Presentation of Plaque and Past President's Pin to Retiring President

XV Report by Boston Convention General Chairman.
XVI Reports by Future Convention Chairmen (Milwaukee, Atlantic City, St. Louis, New York, Miami).
XVII Report of Ninth Interim Meeting (1962) Chairman.
XVIII Selection of Convention City of AES's Fifty-Fourth Annual Convention (1967).
XIX Selection of Site and Date of Tenth Interim Meeting (1963).
XX Resolution of Thanks to Boston Branch.
XXI Adjournment of ANNUAL MEETING.

FORTY-EIGHTH ANNUAL CONVENTION
AMERICAN ELECTROPLATERS' SOCIETY, INC.

SPONSOR: American Electroplaters' Society, Inc. (AES), American Building, 443-445 Broad Street, Newark 2, New Jersey, and its 60 chartered American, Canadian and Australian Branches.

HOST BRANCH: Boston Branch of American Electroplaters' Society, Inc., itself observing its Fortieth Anniversary as a chartered Branch of AES.

SITE AND HOTEL: Statler-Hilton Hotel, Boston, Massachusetts.

DATES: June 18-23, 1961—in AES's Fifty-Second year. Boston's Mayor has proclaimed this "American Electroplaters' Society Week" in Boston.

ADULT REGISTRATION: For male and female adults—$25 per person, including Banquet, Outing, Boston Pops and all other AES official Convention events.

CHILDREN REGISTRATION: For registered children—$15 per child, not including Banquet or Boston Pops Concert but including three days of supervised sightseeing and children's program events, plus the Outing. Banquet tickets available at $8.50 per child extra. To the extent available, Boston Pops Concert tickets for registered older children, $1.50 per child extra.

HOTEL ACCOMMODATIONS: Order direct via Hotel Reservation Form already mailed to all AES members.

CONVENTION GENERAL CHAIRMAN: Louis V. Gagnon, P. O. Box 329, Framingham, Massachusetts.

LADIES CHAIRMAN: Mrs. George Parsons Swift, 40 Colonial Avenue, Waltham 54, Massachusetts.

GRAND OPENING SESSION • EDUCATIONAL PROGRAM • AES BOARD AND COMMITTEE MEETINGS • LADIES PROGRAM • CHILDREN'S PROGRAM • PLANT TOURS • DANCES • SIGHTSEEING • CLAMBAKE • BOSTON POPS CONCERT • SPONSORED RELAXATIONAL PROGRAMS • COCKTAIL PARTIES • GET-TOGETHER • GOLF TOURNAMENT • BANQUET • ENTERTAINMENT • FLOOR SHOW

Simon D. Strauss

METALS AUTHORITY TO KEYNOTE AES'S BOSTON NATIONAL CONVENTION

A well-known authority on metals, Simon D. Strauss, President of the American Zinc Institute and a Vice President of the American Smelting and Refining Company (ASARCO), will deliver the Keynote Address at the Grand Opening Session of the 48th Annual Convention of American Electroplaters' Society, Statler-Hilton Hotel, Boston, Massachusetts, Monday, June 19, 1961, before an expected capacity audience of AES members, their families and guests.

Mr. Strauss was born in Lima, Peru, in 1911, and attended school in Chile before his family moved to New York in 1921. At the age of 16, he left City College of New York to become an assistant editor of the Engineering and Mining Journal, where he remained until 1932. He then spent two years as editor of a newspaper in Madison, New Jersey.

During World War II, Mr. Strauss became a Vice President of the Metals Reserve Co. (MRC), a subsidiary of the Reconstruction Finance Corp. The MRC was responsible for contracts to supply strategic foreign metals for the United States. He joined Asarco in 1946, becoming Sales Manager in 1947 and Vice President in charge of sales in 1949.

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AES BOSTONIAN TO PRONOUNCE CONVENTION INVOCATION

Leonard A. Chesworth of Stoughton, Massachusetts will pronounce the invocation at the Grand Opening Session of the AES's 48th Annual Convention to be held at the Statler-Hilton Hotel, Boston, Massachusetts, on Monday morning, June 19, 1961.

A "Plater Minister", Mr. Chesworth is a long-time member of the Boston Branch, host of the 48th Annual Convention, and a Past Branch President. He is associated with the United Car Fastener Corporation of Cambridge, Massachusetts and with the Church of Jesus Christ of Latter Day Saints.

TENTATIVE PROGRAM

FORTY-EIGHTH ANNUAL CONVENTION
AMERICAN ELECTROPLATERS' SOCIETY, INC.

STATLER-HILTON HOTEL, BOSTON, MASSACHUSETTS, JUNE 18-23, 1961

SUNDAY, JUNE 18

9:00 a. m.	Executive Board Meeting (All Day)	AES Headquarters Room
1:00–8:00 p. m.	Registration	Mezzanine
2:00 p. m.	Honorary Membership Award Committee Meeting	Room 418
2:00 p. m.	AES Scientific Achievement Award Committee Meeting	Room 410
3:00 p. m.	Ladies Program Tea of Welcome (Tentative)	Bay State Room
4:00 p. m.	Credentials Committee Meeting with Executive Board	Headquarters Room
8:00 p. m.	AES Get-Together Party	Grand Ballroom

MONDAY, JUNE 19

8:00 a. m.-9:00 p. m.	Registration	Mezzanine
9:30 a. m.	Children's Program (Tour of Salem-Marblehead Area, including Luncheon)	Buses from Statler Hotel
10:00 a. m.	Grand Opening Session	Grand Ballroom
	Invocation — Leonard A. Chesworth, Boston Branch	
	Keynote Address — Simon D. Strauss, President, American Zinc Institute and Vice President, American Smelting and Refining Co.	
11:00 a. m.	Business Meeting Supreme Society	Grand Ballroom
12:00 noon	Branch Secretaries' Luncheon	Parlor A
12:15 p. m.	Speakers' Luncheon	Parlor B
12:30 p. m.	Ladies Luncheon, *Sponsored by The Udylite Corporation*	Ballroom Assembly
1:00 p. m.	Plant Visit. Keystone Camera Co.	Buses from Statler Hotel
1:00 p. m.	Plant Visit. Boston Globe	Buses from Statler Hotel
2:00 p. m.	Opening Educational Session (The William Blum Lecture)	Grand Ballroom
	"The Challenge Before Us" by Dr. Charles L. Faust	
2:30 p. m.	Editorial Board Meeting	Parlor C
2:30 p. m.	Publications Committee Meeting	(To be Announced)
2:30 p. m.	Educational Session A (Research)	Grand Ballroom
	1. "The AES Research Program" by Dr. D. Gardner Foulke, Sel-Rex Corp.	
	2. AES Research Project No. 15—"Progress Report on the Development of Corrosion Tests for the Performance of Plated Coatings" by Walter L. Pinner, McGean Chemical Co.	
	3. AES Research Project No. 14—"A Microscopic Study of Chromium Plating" by M. H. Jones and J. Saiddington, Ontario Research Foundation	
2:30 p. m.	Educational Session B (Organic Finishing)	Georgian Room
	4. "Functional Vinyls Go Decorative" by Fremont L. Scott and Hyman Metz, Metal & Thermit Corp.	
	5. "Experience-Proven Epoxy-Acrylic Finish System" by Robert F. Howard, Bell Helicopter Co.	
4:00 p. m.	Order of Past Presidents Meeting	Hancock Room
6:00 p. m.	Order of Past Presidents Dinner	Hancock Room
8:00 p. m.	MFSA Ball	Grand Ballroom

TUESDAY, JUNE 20

8:00 a. m.	Charles Henry Proctor Memorial Leadership Award Selection Committee Breakfast	Room 418
8:00 a. m.	Speakers' Breakfast	Parlor C
9:00 a. m.–5:30 p. m.	Registration	Mezzanine
9:00 a. m.	Educational Session C (Finishing of Light Metals Symposium)	Grand Ballroom
	6. "Nickel-Chromium Plating Upon Anodized Aluminum" by H. J. Wittrock, Kaiser Aluminum & Chemical Corp.	
	7. "Conversion Coating of Aluminum Alloys" by Dr. J. F. Murphy, Metallurgical Laboratories, Olin Mathieson Chemical Corp.	
	8. "Outdoor Exposure of Anodic Coatings on Aluminum: Effect of Sealing" by Dr. R. C. Spooner, Aluminium Laboratories Ltd.	
	9. "Effect of Voltage During Anodizing of Aluminum" by W. C. Cochran and F. Keller, Alcoa Research Laboratories, Aluminum Company of America	
9:00 a. m.	Membership Committee Meeting	Room 436
9:00 a. m.	Public Relations Committee Meeting	Room 438
9:00 a. m.	Educational Committee Meeting	Room 440
9:00 a. m.	Plant Visit. Gillette Safety Razor Co. (1st group)	Buses from Statler Hotel
9:30 a. m.	Ladies Program (Scenic Tour of North Shore enroute to Ipswich)	Buses from Statler Hotel
9:30 a. m.	Children's Program (Tour of Boston and Cambridge. Lunch at Smith House)	Buses from Statler Hotel
12:00 noon	Joint Educational Committee and Branch Librarians Luncheon	Parlor A
12:00 noon	Speakers' Luncheon	Parlor C
12:00 noon	Ladies Luncheon (Castle Hill, Crane Estate, Ipswich, Mass.) *Sponsored by M. E. Baker Company, The Lea Manufacturing Company and Lea-Ronal, Inc.*	Buses 9 a. m. from Statler Hotel
1:00 p. m.	Plant Visit. Gillette Safety Razor Co. (2nd group)	Buses from Statler Hotel
2:00 p. m.	Educational Session D (Finishing of Light Metals Symposium)	Grand Ballroom
	10. "Plating on Magnesium by Electrodeposition and Chemical Reduction Methods" by H. K. DeLong, Dow Metal Products Company, Division of the Dow Chemical Co.	

TUESDAY, JUNE 20 (continued)

11. "Anodic Treatments for Magnesium" by J. S. Kirkpatrick, Brooks and Perkins, Inc.
12. "Chromic Acid Anodizing of Beryllium: Process Variables" by L. Whitby, E. Gowen and D. J. Levy, Lockheed Aircraft Corp.
13. "Chromic Acid Anodizing of Beryllium: Process Development" by Leo Missel, Lockheed Aircraft Corp.

2:00 p. m. **AES Midwest Regional Council Meeting** **434**
2:00 p. m. **Southwestern Regional Council Meeting** **436**
2:00 p. m. **Other Individual AES Regional Council Meetings (If Any)** ..... **(To be Announced)**
4:00 p. m. **AES Regional Group and Council Chairmen's Meeting** ..... **Room 442**
4:30 p. m. **Finishing of Light Metals Forum** ..... **Grand Ballroom**
8:30 p. m. **"Fun with Fiedler" at Boston Pops** ..... **Boston Symphony Hall**

WEDNESDAY, JUNE 21

8:00 a. m. **Research Committee Breakfast** ..... **Parlor A**
8:00 a. m. **Speakers' Breakfast** ..... **Parlor B**
9:00 a. m.–12:00 noon **Registration** ..... **Mezzanine**
9:00 a. m. **Educational Session E** ..... **Grand Ballroom**

14. "Quality Control Study to Determine Optimum Conditions for Barrel Plating in Zinc Cyanide Solutions" by Dr. Russel M. Harr, Western Electric Company
15. "The Practical Application of Statistics to the Quality Control of Electroplated Products" by James J. Glass and James K. Gore, Los Alamos Scientific Laboratory
16. "Objectives in Corrosion Protection of Bright Decorative Trim and Their Implementation" by John McDougall, Ford Motor Co.

9:00 a. m. **Educational Session F** ..... **Georgian Room**

17. "The Anodic Behavior of Metals in Cleaning Media—Copper and Its Alloys" by Samuel S. Frey, Oakite Products, Inc.
18. "Improved Adhesion of Electroless Nickel Plate on Titanium Alloys" by Milton Levy and John B. Romolo, Watertown Arsenal Laboratories

9:00 a. m. **Research Committee Meeting** ..... **Parlor C**
1:30 p. m. **AES Annual Outing (Clambake at Historic Plymouth, Mass.)** ..... **Buses from Statler Hotel**

THURSDAY, JUNE 22

8:00 a. m. **Speakers' Breakfast** ..... **Hancock Room**
9:00 a. m. **Business Meeting, Supreme Society** ..... **Parlors A, B, C**
9:00 a. m. **Educational Session G** ..... **Grand Ballroom**

19. "Precious Metal Plating and Solderability" by A. Korbelak and R. Duva, Sel-Rex Corp.
20. "Vapor Deposition of Aluminum by Thermal Decomposition" by Edgar H. Maus Sr., Queen City Steel Treating Company
21. "Stoichiometry of Copper Bonding Using Copper Oxide" by Edward B. Murphy and Thomas P. Turnbull, Massachusetts Institute of Technology, Lincoln Laboratory

9:00 a. m. **Educational Session H** ..... **Georgian Room**

22. "Corrosion—Current Data for Nickel-Chromium Couples" by W. H. Safranek, H. R. Miller and R. W. Hardy, Battelle Memorial Institute
23. "Electroplating of Zinc-Base Die Castings in a System Incorporating Dual Chromium" by James H. Lindsay, W. E. Lovell, Ternstedt Division of General Motors Corp., and D. W. Hardesty, General Motors Corp. Research Laboratories

9:00 a. m. **Plant Visits. Western Electric Company, North Andover, luncheon at Western Electric plant, afternoon visit at Raytheon Mfg. Co., Andover** ..... **Buses from Statler Hotel**
9:30 a. m. **Ladies Program: Tour of Historic Boston** ..... **Buses from Statler Hotel**
9:30 a. m. **Children's Program (Tour of Museum of Science and Planetarium, followed by Boat ride on the Charles River)** ..... **Buses from Statler Hotel**
12:00 noon **Speakers' Luncheon** ..... **Hancock Room**
12:30 p. m. **Ladies Luncheon at John Hancock Building, *Sponsored by Sel-Rex Corporation*** **(Followed by talk "Gold and Man," illustrated by Oil Paintings)** ..... **Dorothy Quincy Suite**
2:00 p. m. **Business Meeting, Supreme Society** ..... **Parlors A, B, C**
2:00 p. m. **Educational Session I** ..... **Grand Ballroom**

24. "Plating of Printed Circuits with Pyrophosphate Copper and Tin-Nickel" by R. W. Couch and R. G. Bikales, Metal & Thermit Corp.
25. "Evaluation of Solderability of Electroplated Coatings" by L. K. Bjelland and J. M. Thompson, Convair-Pomona, A Division of General Dynamics Corp.
26. "Producing Ultra-High Frequency Electronic Parts by Electroless Copper and Precious Metal Plating on Plastics" by Charles E. MacNeill, The Martin Company

6:00 p. m. **MFSA Cocktail Party** ..... **Georgian Room**
7:00 p. m. **AES Farewell Banquet** ..... **Grand Ballroom**

FRIDAY, JUNE 23

8:00 a. m. **President's Breakfast to National Officers and their Families** ..... **Parlor C**
9:00 a. m. **Executive Board Meeting** ..... **AES Headquarters Room**

(This is a TENTATIVE PROGRAM as of April 14, 1961. Additions and modifications will be made monthly until finalized.)

TENTATIVE PROGRAM

EDUCATIONAL SESSIONS

48th ANNUAL CONVENTION • AMERICAN ELECTROPLATERS' SOCIETY, INC.

STATLER-HILTON HOTEL, BOSTON, MASSACHUSETTS

JUNE 19-22, 1961

MONDAY, JUNE 19

2:00 p.m. ..... Grand Ballroom

Session Chairman—*Dr. William Blum, Consultant*

THE THIRD ANNUAL "WILLIAM BLUM LECTURE"—THE CHALLENGE BEFORE US

by Dr. Charles L. Faust, Battelle Memorial Institute

Research has been the key to progress in the processes used by members of and industries associated with the AES. Greatly improved performance can be attained by electroplates both as coatings and as electroforms. Efforts mainly have been process oriented. The time is here for greater emphasis on product orientation, on consideration of electroplates as materials, and on electrodepositing quality into electroplates instead of devising ways to inspect quality into them. The challenge is to take these steps by instituting the necessary actions.

MONDAY, JUNE 19

2:30 p.m. ..... Grand Ballroom

SESSION A

Session Chairman—*James D. Thomas, General Motors Corporation*

THE AES RESEARCH PROGRAM

by D. Gardner Foulke, 1960-1961 Chairman, AES Research Committee

The origin and philosophy of the AES Research Program are discussed. Accomplishments in the past year are reviewed. Questions are raised as to the future of the AES Research Program and a plea is made for each AES member to acquaint himself with the program. Finally, recommendations are presented based upon the ever-increasing importance of research in a changing world where the only thing that does not change is change itself.

AES RESEARCH PROJECT NO. 15—PROGRESS REPORT ON THE DEVELOPMENT OF CORROSION TESTS FOR THE PERFORMANCE OF PLATED COATINGS

by Walter L. Pinner, McGean Chemical Co., Project Chairman

This report on AES Project 15 sets forth in detail the latest committee-approved procedures for conducting the CASS and Corrodkote Tests. The present status of the Project is summarized and the future aims of the Project Committee are stated. The adaptability of the CASS and Corrodkote Tests to finishing systems other than copper and or nickel-chromium coatings on steel and zinc alloy basis metals is discussed. Information correlating the corrosion test results with service data is presented.

AES RESEARCH PROJECT NO. 14—A MICROSCOPIC STUDY OF CHROMIUM PLATING

by M. H. Jones and J. Saiddington, Ontario Research Foundation

An apparatus is described for the direct microscopic observation of the deposition of chromium on nickel and other basis metal surfaces. The study has provided information on the initial nucleation pattern, the development of cracking in chromium deposits and the associated hydrogen gas evolution for various plating conditions. The work constitutes an extension of the preliminary investigation of Brittain and Smith and the microscopic observations are considered in relation to the mechanism of chromium deposition.

MONDAY, JUNE 19

2:30 p.m. ..... Georgian Room

SESSION B

Session Chairman—*Manson Glover, Glover Coating Co., Inc.*

FUNCTIONAL VINYLS GO DECORATIVE

by Fremont L. Scott and Hyman Metz, Metal & Thermit Corporation

The spray application of vinyls as decorative finishes for consumer and industrial products is presented. The properties—corrosion resistance, toughness, resiliency—of plastisols already well known in their functional uses in the electroplating industry are maintained by the organosol technique used to produce attractive decorative finishes. Advantages of the spray-on organosols over the vinyl laminate and pre-coated vinyl sheet are outlined and demonstrated. Case histories on the use of spray-on organosols in the appliance, data processing equipment and automotive fields are covered in detail.

EXPERIENCE-PROVEN EPOXY-ACRYLIC FINISH SYSTEM

by Robert F. Howard, Bell Helicopter Co.

A new finishing system in aircraft, automotive and related fields is presented. Two years of service experience have been completed with this finish system which utilizes the inherent properties of catalyzed epoxies and acrylics. This involves a paint finish setting at room temperature that combines the tenacious adhesion, chemical resistance, and toughness of epoxies, with the excellent resistance to outdoor weathering, diester oil resistance, and attractiveness of acrylics

TUESDAY, JUNE 20

9:00 a.m. ..... Grand Ballroom

SESSION C

Session Chairman—*Dr. G. H. Kissin, Kaiser Aluminum & Chemical Corporation*

NICKEL-CHROMIUM PLATING UPON ANODIZED ALUMINUM

by H. J. Wittrock, Kaiser Aluminum & Chemical Corporation

Nickel-chromium plating upon anodized aluminum is a means of producing a bright corrosion-resistant finish. The method avoids the possibility of aggravated galvanic attack of the basis aluminum experienced when copper is part of the plated coating. The anodizing process for gaining nickel adhesion on various aluminum alloys is outlined and compared with other plating systems. Corrosion resistance in atmospheric and accelerated tests is comparable to that of similarly plated steel and is also benefited by plating techniques that enhance the integrity of the coating such as increasing plate thickness and plating with duplex nickel, crack-free chromium and duplex chromium.

CONVERSION COATING OF ALUMINUM ALLOYS

by J. F. Murphy, Metallurgical Laboratories, Olin Mathieson Chemical Corporation

A review is made of the purposes of oxide, phosphate and chromate coating of aluminum alloys and the phenomena upon which their usefulness is based. There is a brief discussion of the physical and chemical properties of the coatings which are related to corrosion resistance and adhesion. Emphasis is placed upon the relationship between corrosion resistance and chemical composition. The adhesion of organic films to conversion coatings is analyzed in terms of composition and structure. Finally, there is a discussion of the probable mechanisms involved in the conversion coating process, in order to provide some reasonable hypotheses of the relationship between the mechanism of formation, the properties of the coating, and their effectiveness in improving corrosion resistance and adhesion of organic materials.

OUTDOOR EXPOSURE OF ANODIC COATINGS ON ALUMINUM: EFFECT OF SEALING

by R. C. Spooner, Aluminium Laboratories Limited

The outdoor weathering behavior of sulfuric acid anodic coatings on aluminum alloys is discussed. Panels prepared by different procedures, including various anodizing conditions, a wide range of sealing treatments, and several overcoating techniques, were exposed outdoors in Canadian locations for periods up to 10 years. The nature of weathering attack is described for both bold and protected exposure conditions. Performance in laboratory tests and outdoor exposure is correlated with the various anodizing, sealing and coating procedures that were used.

EFFECT OF VOLTAGE DURING ANODIZING OF ALUMINUM

by W. C. Cochran and F. Keller, Alcoa Research Laboratories, Aluminum Company of America

The voltage employed during anodic treatment of aluminum alloys plays a major part in establishing several important characteristics of the oxide coatings produced. Such features as brightness, specularity and abrasion resistance of the anodic finish can vary widely depending on the forming voltage. This factor is influenced by the presence of various alloying elements in commercial aluminum alloys. Data are presented showing how the anodizing voltage influences the appearance of an anodic coating. Anodizing procedures for obtaining bright, decorative finishes with optimum image clarity are discussed.

TUESDAY, JUNE 20

2:00 p.m. ..... Grand Ballroom

SESSION D

Session Chairman—*Charles Levy, Gillette Safety Razor Co.*

PLATING ON MAGNESIUM BY ELECTRODEPOSITION AND CHEMICAL REDUCTION METHODS

by H. K. DeLong, Technical Service & Development Laboratory, Dow Metal Products Company, Division of the Dow Chemical Company

Recently there has been an increasing demand for plating on magnesium base alloys for electronic equipment in the aircraft and missile fields. Applications wherein combined good grounding, conductivity, solderability, and protection are a requisite are now being plated with final deposits of tin, nickel, silver, gold, platinum, etc. Also the increased use of these alloys in die cast form in the automotive field has prompted a demand for an effective and economical method of decorative chromium plating. Various methods of applying plated coatings to magnesium alloys are described along with some data on their relative corrosion performance in accelerated test environments. A new method is presented applying nickel on magnesium by chemical reduction.

ANODIC TREATMENTS FOR MAGNESIUM

by J. S. Kirkpatrick, Brooks and Perkins, Inc.

After a review of general finishing techniques for magnesium there will be an analysis of typical corrosion behavior of magnesium alloys. The various protective anodic treatments which are applicable to commercial magnesium alloys will be described and the important process parameters will be outlined, together with their effect upon the physical and chemical properties of the coatings produced. The use of anodic coatings in typical commercial applications will be described.

CHROMIC ACID ANODIZING OF BERYLLIUM: PROCESS VARIABLES

by L. Whitby, E. Gowen and D. J. Levy, Lockheed Aircraft Corporation

Corrosion protective coatings are formed by anodizing beryllium in chromic acid producing adherent glossy-black coatings which are chiefly BeO. The films possess little porosity but have sufficient ionic permeability to permit growth. Film thickness is initially a linear function of current consumption but is independent of current density over a wide range. Film thickness also increases with chromic acid concentration up to 10 per cent beyond which it remains constant.

CHROMIC ACID ANODIZING OF BERYLLIUM: PROCESS DEVELOPMENT

by Leo Missel, Lockheed Aircraft Corporation

Practical methods of pre-anodic preparation and of chromic acid anodizing of beryllium are described. A jet black, glossy coating with excellent protective properties was obtained. Basis metal quality and its effects on the anodic coating are discussed.

WEDNESDAY, JUNE 21

9:00 a.m. — Grand Ballroom

SESSION E

Session Chairman—*Dr. George P. Swift, Consultant*

QUALITY CONTROL STUDY TO DETERMINE OPTIMUM CONDITIONS FOR BARREL PLATING IN ZINC CYANIDE SOLUTIONS

by Russel M. Harr, Western Electric Company

Variations in the distributions of plating thickness caused by changes of barrel rotational speed, current density, and some effects of solution composition were studied by quality control techniques. Abbreviated form of process capability studies was used for this investigation.

THE PRACTICAL APPLICATION OF STATISTICS TO THE QUALITY CONTROL OF ELECTROPLATED PRODUCTS

by James J. Glass and James K. Gore, Los Alamos Scientific Laboratory

A practical use of statistics in quality control is described. A system is presented that offers a simple and economic way for inspectors to classify production lots. An actual use of the plans is related in detail and the calculations are described. Results of the use of this method as an inspection tool are graphically shown and the usefulness of the system to the modern plater is demonstrated.

OBJECTIVES IN CORROSION PROTECTION OF BRIGHT DECORATIVE TRIM AND THEIR IMPLEMENTATION

by John McDougall, Ford Motor Company

The Ford Motor Company was not satisfied with the quality of bright decorative automotive trim. The program that was effected to improve the durability of plated steel stampings and zinc die castings, anodized aluminum, and stainless steel parts is discussed. By an analysis of extensive data obtained by field surveys, mobile tests, and accelerated laboratory tests, the corrective action required to obtain improved durability was determined.

WEDNESDAY, JUNE 21

9:00 a.m. — Georgian Room

SESSION F

Szssion Chairman—*Hubert H. Foley, Raytheon Manufacturing Co.*

THE ANODIC BEHAVIOR OF METALS IN CLEANING MEDIA—COPPER AND ITS ALLOYS

by Samuel S. Frey, Oakite Products, Inc.

The anodic behavior of copper and brass specimens in several alkaline media is discussed. A new experimental procedure for making such studies is detailed. Parameters studied include current density, time and composition, concentration, and temperature of the solution. The specimens are subsequently plated with bright nickel, and evaluated with respect to appearance and adhesion.

IMPROVED ADHESION OF ELECTROLESS NICKEL PLATE ON TITANIUM ALLOYS

by Milton Levy and John B. Romolo, Watertown Arsenal Laboratories

Electroless nickel-phosphorus alloy plate was investigated as an anti-galling coating for titanium alloys. The alloy was deposited in a modified National Bureau of Standards alkaline bath. Adherence and abrasion resistance were improved by heat treating at relatively high temperatures. Diffusion bonding with a minimum of beta transformation was detected by metallographic and X-ray diffraction studies. Resistance to wear and abrasion was correlated with structure, assessed metallographically.

TUESDAY, JUNE 22
9:00 a.m. ..... Grand Ballroom

SESSION G

Session Chairman—*William P. Innes, Mac Dermid, Inc.*

PRECIOUS METAL PLATING AND SOLDERABILITY

by A. Korbelak and R. Duva, Sel-Rex Corporation

Various precious metal electrodeposits are discussed in conjunction with solderability as the last step in electronics manufacture. The effects of thickness, impurities in the deposits and time-temperature conditions of various solders on solderability are given. Transistor, printed circuit and relay manufacture utilizing specific precious metal electroplates are detailed.

VAPOR DEPOSITION OF ALUMINUM BY THERMAL DECOMPOSITION

by Edgar H. Maus Sr., Queen City Steel Treating Company

Comparison of the thermal decomposition method versus the standard vacuum method, as well as engineering methods are discussed. A diagram of a typical facility is shown. Types of compounds for use in this method are presented. Deposition variables are given as are properties of coating-to-basis metal bonding.

STOICHIOMETRY OF COPPER BONDING USING COPPER OXIDE

by Edward B. Murphy and Thomas P. Turnbull, Massachusetts Institute of Technology, Lincoln Laboratory

A good physical bond and electrical connection can be achieved between a copper metal item and a film of copper chemically reduced from an aqueous solution by the use of a temporary oxide film. Data are reported on the physical properties of the bond and on oxidation reactions of copper. Electron diffraction patterns and micrographs of the oxides are presented. Chemical reaction products of each processing step have been observed and explored.

THURSDAY, JUNE 22
9:00 a.m. ..... Georgian Room

SESSION H

Session Chairman—*Dr. M. M. Beckwith, The Harshaw Chemical Co.*

CORROSION-CURRENT DATA FOR NICKEL-CHROMIUM COUPLES

by W. H. Safranek, H. R. Miller and R. W. Hardy, Battelle Memorial Institute

When nickel electroplate is coupled with chromium, a high current density and corrosion rate at the anode, usually nickel, are favored by a high electrolyte concentration, a high temperature, and a low nickel-to-chromium area ratio. The passivity of the chromium, which is dependent upon aging conditions, has a profound influence on the corrosion current. The information in this paper, based on research conducted for the American Zinc Institute, resolves some anomalies that obscured factors bearing on the corrosion of electroplated zinc die castings.

ELECTROPLATING OF ZINC-BASE DIE CASTINGS IN A SYSTEM INCORPORATING DUAL CHROMIUM

by James H. Lindsay, W. E. Lovell, Ternstedt Division of General Motors Corporation, and D. W. Hardesty, General Motors Corporation Research Laboratories

Zinc-base die castings for automobile body hardware have been electroplated on a large scale in a system involving the use of dual chromium. General plating practices are discussed. Problems arising from the use of dual chromium and the raising of performance standards are covered in some detail. Operation of the chromium baths is described, including discussion of factors involved in the maintenance of the micro-crack pattern. Corrosion resistance data are given.

THURSDAY, JUNE 22
2:00 p.m. ..... Grand Ballroom

SESSION I

Session Chairman—*Dr. Harold Narcus, Electrochemical Industries, Inc.*

PLATING OF PRINTED CIRCUITS WITH PYROPHOSPHATE COPPER AND TIN-NICKEL

by R. W. Couch and R. G. Bikales, Metal & Thermit Corporation

Printed circuits require electrical reliability, wear and corrosion resistance. The copper/tin-nickel system can be plated from standard production baths at lower cost and with improved quality over copper-gold. Pyrophosphate copper produces smooth, dense coatings on the surface and "through holes." The solution does not attack stop-off or laminated board. Tin-nickel offers corrosion resistance, low contact resistance, solderability and retention of solderability when used as a top coat. Its hardness improves wear.

EVALUATION OF SOLDERABILITY OF ELECTROPLATED COATINGS

by L. K. Bjelland and J. M. Thompson, Convair-Pomona, A Division of General Dynamics Corporation

Various electroplated coatings were evaluated to determine the effect of shelf life on their solderability by exposing plated terminals to a factory atmosphere for periods up to one year. A tensile test was developed whereby solder joints were evaluated quantitatively to determine the quality of the connections. Other tests conducted included solderability, corrosion resistance, resistance to oxidation, and plating thickness. The results of the tensile test proved to be statistically valid. From this it was found that some electrodeposited films produced stronger and more reproducible connections than other coatings.

PRODUCING ULTRA-HIGH FREQUENCY ELECTRONIC PARTS BY ELECTROLESS COPPER AND PRECIOUS METAL PLATING ON PLASTICS

by Charles E. MacNeill, The Martin Company

A research program was conducted to evaluate the feasibility of producing ultra-high frequency electronic parts using electroless and precious metal plating on plastics. An optimum process was developed and the properties of plated parts evaluated. Typical electronic assemblies were fabricated using plated plastics to evaluate electronic characteristics. It was found that plated plastic parts could be substituted for plated metal parts to result in an improved end item.

INTERSOCIETY NEWS

ASTME EXPOSITION OPENS MAY 22 IN NEW YORK

Highlighting the 1961 Convention of the American Society of Tool and Manufacturing Engineers in New York, May 22 to 26, will be an exposition of creative manufacturing equipment and an engineering conference.

It is expected that 400 exhibitors will participate. The huge New York industrial area—more than 1,000,000 people are employed in manufacturing industries—will produce a new ASTME Exposition attendance record, it is predicted.

Technical sessions, plant tours, Tech Tours, a seminar and a special public affairs program have been designed to survey new processes and techniques, giving the manufacturing engineer a panoramic picture of industrial progress.

♦

LEAD-ZINC STUDY GROUP TOLD COOPERATIVE RESEARCH NEEDED

The much-needed creation of new uses for zinc and lead, plus the expansion of existing markets for these traditional metals can be achieved most effectively through cooperative international research, declared Dr. Schrade F. Radtke, Research Director of a broad-scope research program sponsored by American Zinc Institute and Lead Industries Association. Only with such a program supplemented by vigorous sales and marketing efforts can the zinc and lead industries survive in our highly competitive world market, he said.

Dr. Radtke spoke in Mexico City on March 22 before the third session of the United Nations' International Lead-Zinc Study Group, consisting of representatives of 25 zinc and lead producing and consuming countries. Mexican Ambassador to the United States Antonio Carrillo Flores presided.

♦

ASTM COMMITTEES MEET IN CINCINNATI

Thirty-two of the American Society for Testing Materials' main technical committees met during Committee Week, January 30 to February 3, at the Netherland Hilton Hotel in Cincinnati. Over 1200 engineers and scientists working in 360 committee sessions moved forward on a broad front in developing new material standards as well as bringing current ASTM standards up to date.

The members of the Ohio Valley District were sponsors of the annual Committee Week Dinner on Wednesday, February 1. Dr. Bernard B. Berger, chief, water supply and pollution control research, of the Robert A. Taft Sanitary Engineering Center, spoke about the important and interesting work of the center relating to stream pollution and the control of water quality. The social, political, legal, economic, and technical factors are so intertwined that they are challenging the best minds in these fields. Among the more serious problems is an evaluation of our ability to continue to cope with the increasing sources of pollution and to monitor their effects in our streams.

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LATEST DEVELOPMENTS FEATURE OF LEAD MEETING

"Lead's New Frontiers" will be the theme of the 33rd Annual Meeting of the Lead Industries Association to be held on May 2 and 3, 1961, at the Drake Hotel, Chicago. One entire session will be devoted to the latest developments that are keeping lead abreast of the rapid pace of modern technology.

At another session Research Director S. F. Radtke will report on the substantial progress being made by the association's own expanded research program in its search for new markets and products. The secretary and staff will also describe the stepped-up educational, advertising and technical service program of the lead industry.

The opening session will be held jointly with the American Zinc Institute and will include papers of broad interest to both industries on national and international developments and the general economic outlook.

PAPERS ON CERAMIC-ON-METAL PROCESSES PLANNED FOR CERAMIC SOCIETY MEETING

High temperature protective ceramic coatings, ceramic-metal composites, ceramic coatings as adhesives, flame-sprayed ceramic and cermet coatings for metals, and ceramic coatings on dielectrics will be the subject of a program of scientific papers, planned for September 20–23, 1961, by the Enamel Division of The American Ceramic Society.

The science of metals to ceramic adherence and the interaction of the two materials have long been matters of investigation by the porcelain enamel industry, and particularly by members of the Enamel Division of The American Ceramic Society. In recent years these processes have become of interest also to many industries outside the traditional porcelain enamel field, notes the Division's chairman, Hollis Saunders of Phelps Dodge Copper Products Corp.

The program for the September meeting is being organized by R. S. Sheldon of the Whirlpool Corporation, St. Joseph, Mich. The meeting will be held at the French Lick-Sheraton Hotel, French Lick, Ind.

"There are many fields of industry that utilize enameling technology and reactions," points out Loran S. O'Bannon of Battelle Memorial Institute, vice chairman of the Division and in charge of planning the September meeting. "It is our observation that the people who are concerned with the scientific aspects of this field have been without a media for the exchange of information. With our long history of work in ceramic-metal reactions and adherence studies, we believe we have a natural point of focus, and much to offer. The program we are preparing is for that purpose."

Other members of the committee planning the September meeting are Dwight G. Bennett of the University of Illinois, Samuel W. Bradstreet of Armour Research Foundation, Dwight G. Moore of the National Bureau of Standards, Thomas S. Shevlin of Ohio State University, W. Michael Sterry of Boeing Airplane Co., J. H. Terry of General Electric Co., and Jesse D. Walton Jr. of Georgia Institute of Technology.

Requests for further details and for copies of the program when completed, may be addressed to The American Ceramic Society, 4055 North High Street, Columbus 14, Ohio.

TOOL EXPOSITION OF ASTME at N. Y. COLISEUM

More than 6000 time saving, cost cutting products for use on American production lines will be shown at the American Society of Tool and Manufacturing Engineer's Tool Exposition at the New York Coliseum, May 22 to 26.

Most of these products are based on recent scientific advances. A parts cleaner designed for cleaning precision missile and electronic parts, for example, uses ultrasonic energy as a source of power.

Advanced computer technology has resulted in the development of fully automatic machine controls and these will be exhibited.

Other new items to be shown for the first time at the Tool Exposition include a high speed bonded titanium carbide. A disintegrating machine used for removing broken taps, drills, reamers and other hardened tools from castings, dies, etc., and for piercing shaped holes in hardened dies without annealing and without distorting the castings or dies will also be shown.

Concurrent with the Exposition will be the Society's 29th Annual Engineering Conference at the Statler Hilton Hotel, which will feature plant tours, technical sessions, tech tours, a seminar, symposium, and public affairs panel.

♦

CAMI SPONSORS CAMPAIGN TO STANDARDIZE BELT LENGTHS

Encouraging progress is being reported in a campaign to standardize the lengths of coated abrasive belts. Sponsoring body is the Coated Abrasives Manufacturers Institute, whose committee on standardization is seeking to relieve what it believes is a needlessly confusing and costly situation that has been developing for decades.

If the campaign is adopted, as now seems certain, beneficiaries will be the belt user, which is to say American industry as a whole; the manufacturers of belt machines of all kinds, and the abrasives industry itself.

Under existing specifications, no fewer than 104 different belt lengths are being manufactured in lengths from 12 through 168 inches; some are being made to sixteenths of an inch. Such a situation tends toward unwieldy inventories, purchasing difficulties and manufacturing expense.

♦

DIE CASTING ENGINEERS TO HOLD EXPOSITION

The Second National Die Casting Exposition and Congress will be held in Detroit's Cobo Hall from September 25–28, 1962. The exposition is expected to attract 150 exhibitors and occupy a 40,000-sq ft floor space.

♦

CHEMISTS ASSOCIATION WILL HEAR SECRETARY HODGES

Secretary of Commerce Luther H. Hodges and Robert C. Tyson, chairman of the finance committee of United States Steel Corp., will be the principal speakers at the 89th annual meeting of the Manufacturing Chemists' Association, Inc.

Approximately 800 executives from some 130 chemical companies located in the U. S. and Canada will attend the meeting at The Greenbrier, White Sulphur Springs, West Virginia, June 8–10.

Secretary Hodges will be the guest speaker at the annual banquet, June 9, and Mr. Tyson will address the industry leaders at the business meeting the morning of June 8.

During the business session the Association will present awards to six outstanding educators, culminating the MCA's 1961 College Chemistry Teacher awards. Each award includes a medal, citation and check.

♦

CLARK TO RECEIVE ASM AWARD

Dr. Claude L. Clark, Timken Roller Bearing Co., metallurgical engineer, will receive the Albert Sauveur Achievement Award of American Society for Metals, according to Dr. William A. Pennington, national president of the 34,000 member society. Presentation will be made during the 43rd ASM National Metal Congress and Exposition, October 23–27 at Cobo Hall, Detroit.

Dr. Clark's award will be a highlight of the American Society for Metals annual banquet, Wednesday evening, October 25 in the grand ballroom of Cobo Hall, scene of all ASM technical sessions and educational exhibits in the 1961 Detroit Metal Show. Educational theme-feature of the week-long event will be an ASM Materials Comparison Center, in which will be displayed thousands of examples of metalworking materials and processes.

(Top) The annual dinner of the Institute of Metal Finishing held at the Cafe Royal, Piccadilly, London on December 5, 1960. (Bottom) Some of the guests of honor at the IMF's annual dinner: left to right, Sir Harry Melville, Director of the Department of Scientific and Industrial Research; Mrs. Harvey; President A. A. B. Harvey; Mrs. Bennett; Sgn. Lt.-Com. R. F. B. Bennett, Chairman of the Parliamentary and Scientific Committee; Lady Melville; and the Hon. Secretary, Dr. S. Wernick. It will be remembered that Mr. Harvey and Dr. Wernick presented papers at the Fifth International Conference on Electrodeposition and Metal Finishing at the AES's Golden Jubilee Convention, in Detroit, Michigan, June 1959.

FUTURE MEETINGS

Education is the business of AES. For National, Regional and Branch educational and other AES meetings ahead, see PLATING's section titled FUTURE MEETINGS herein.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

2,960,420, 11/15/60—METAL BLACKENING—A. Mitchell, assignor to Mitchell-Bradford Chemical Co., Milford, Conn.

The addition of a trace to 20 parts by weight of a cyclic sulfur-containing organic compound (eq. 2-mercaptobenzothiazole) to conventional blackening salts is claimed to prevent smut formation.

10 claims.

♦

2,960,451, 11/15/60—REFRACTORY METALS—H. Slatin, 11 Bank Street, New York, N. Y.

A molten bath method for the preparation of molybdenum and tungsten is claimed.

20 claims.

♦

2,960,456, 11/16/60—ANODE DEVICE—J. Davis, Udylite Corp., Detroit, Mich.

An anode shifting device for a plurality of anodes is described.

20 claims, figure.

♦

2,961,336, 11/22/60—COATING STRIP—A. Uhleen, assignor to National Steel Corp , Delaware.

Heated paint is applied to hot strip as the latter is moved past a metering device.

4 claims, figure.

♦

2,961,337, 11/22/60—PREPARING METAL FOR ENAMELING—E. Bryant and V. Luster, assignors to Ferro Corp., Cleveland, Ohio.

Ferrous base metal after a preliminary cleaning operation is heated to 1000F to 1300F to oxidize from 1 to 4 grams of base metal per square foot of surface, after which a porcelain enamel cover coat is applied directly to the steel.

16 claims, figure.

♦

2,961,358, 11/22/60—MAGNESIUM CONVERSION COATING—F. Heller, assignor to Amchem Products, Inc., Ambler, Pa.

A chromate conversion coating for magnesium is formed in an aqueous hexavalent chromium solution (15–25 g/l), chloride (20–160 g/l) and 0.8 to 1.5 g of nitrate (as Na NO_3) for each gram of chloride.

3 claims.

♦

2,961,385, 11/22/60—METHOD OF FORMING SLIP-RINGS—E. McGall, assignor to Breeze Corporation, Inc., Union, N. J.

An electroforming method for the manufacture of slip-rings is claimed.

8 claims, figure.

2,961,386, 11/22/60—NICKEL PLATING—U. F. Marx, assignor to Wilmot Breeden, Ltd., Birmingham, England.

The use of 6-sulphamidocoumarin, 6-aminocoumarin, 6-nitrocoumarin and 6-acetamidocoumarin as leveling agents in nickel baths is claimed.

11 claims.

♦

2,961,395, 11/22/60—PORTABLE PLATING DEVICE—Jean Icxi, 29 Rue Dareau, Paris, France.

Claim 1 reads: A portable manually operable plating device comprising a body of electrical insulating material providing a handle and having a pair of forwardly extending tubular arms, electrical conducting members mounted in each of said arms and each having a passageway provided therethrough, a shaft of current conducting material connected to and extending between said conducting members and having passageways in communication with said conducting member passageways, a current conducting roller rotatably mounted on said shaft, absorbent material mounted on said roller for holding the plating electrolyte, so means for connecting said conducting members to a source of electrical current and a pair of tubes each connected to one of said arms for connecting same to a supply of a coolant under pressure.

11 claims, figure.

♦

2,961,746, 11/29/60—PRINTED CIRCUITS—H. Lyman, Milford, Conn., assignor to Aladdin Industries, Nashville, Tenn.

A method of printed circuit manufacture is described wherein a pressure sensitive cement is applied to a stainless steel plate, followed by photoresist. After hardening the resist and cement is stripped by solvent, the bare stainless steel areas plated, then the circuit and remaining resist and cement peeled from the stainless steel and etched to remove any adhering stainless steel.

9 claims, figure.

♦

2,962,364, 11/29/60—DEVELOPING IMAGES ON METALS—J. Cornish, assignor to Modern Engraving and Machine Co., Hillside, N. J.

To form etched designs on aluminum, first clean the surface with a pre-etch solution of hydrochloric acid saturated with sodium chloride, deposit an image-forming resist on the surface, removing the coating from the area to be etched and treat with an iron perchloride solution containing hydrochloric acid saturated with sodium chloride.

5 claims.

♦

2,962,391, 11/29/60—CHROMIZING—G. Samuel, et. al., assignors to David Craven, Wilmington, Del.

Articles to be chromized are placed in a closed space along with chromium and 0.1 to 2 per cent of hydrazine hydrohalide and heated to 1600 to 2300F for 30 minutes.

8 claims, figure.

♦

2,962,394, 11/29/60—PLATING SEMICONDUCTORS—R. Andres, assignor to Motorola, Inc., Chicago, Ill.

A silicon semiconductor (PN) with a borosilicate layer on one portion and a phosphosilicate layer on another portion is etched with hydrofluoric acid and a combination of hydrogen peroxide and an alkali metal hydroxide, then plated with electroless nickel.

2 claims, figure.

♦

2,962,395, 11/29/60—PAINT STRIPPER—L. Brown, assignor to Pennsalt Chemicals Corp., Pa.

The stripper consists of 50–96 per cent of a caustic alkali along with gluconate and an alkyl aryl sulfonate.

12 claims.

TRADE LITERATURE

L—501. ALUMINUM DEOXIDIZER—A new deoxidizer for aluminum which is claimed to be free of chromic and nitric acid and to present no waste disposal problems is fully described in Technical Data Sheet No. 117, a three-page usage and instruction sheet prepared by MacDermid Incorporated.

Called Metex M-662, the product is a mixture of dry acid salts which is dissolved in water and used to prepare aluminum alloys for phosphating, welding, anodizing, painting, plating or bright dipping. The product makes a base for final treatment on all aluminum alloys with the exception of those with high silicon content.

L—502. BARRELS AND BARREL EQUIPMENT—Many new developments for platers are displayed in an illustrated proprietary product brochure now offered by The Singleton Co. The new brochure high lights a wide variety of original and replacement plating cylinders, superstructures, tanks and components to fit its own and all makes of barrel equipment—any type, size, age. Featured are the latest Singleton plating barrels, single or multiple station, cogged-V-belt or gear drive. Included are loading stands, chute loaders, unloaders, etc.

Singleton Cylinder-Superstructure combinations show belt or gear drives, horn-type or inverted-V contacts for universal application.

L—503. CLEANING-PHOSPHATIZING—Kelite Corporation has just published a colorful, eight-page, fully illustrated "special report" on its Mark IV combination steam cleaning-phosphatizing equipment. It has application wherever hand brushing or wiping of metal surfaces is required prior to painting.

L—504. AUTOMATION—A wide range of machines and equipment designed to automate metal finishing operations is described in a fully illustrated 29-page "Guide", published by The Meaker Company, subsidiary of Sel-Rex Corp. Featuring photographs of actual installations—including the world's largest electroplating facility—the new booklet provides profit-increasing data for large or small firms contemplating automation.

Entitled "When to Automate," the booklet also illustrates new types of automatic machinery currently in use by electronic firms for mass production processing of vital components. Detailed tables show: electrochemical equivalents of base and noble metals; data on depositing zinc, copper, tin, nickel, cadmium and chromium; and separate tables for use with acid, cyanide and other recommended solutions.

L—505. CHROMATE CONVERSION COATINGS—Allied Research Products, Inc., has announced the release of two new pieces of literature. The first entitled "Technical Data Chart on Chromate Conversion Coatings" presents a general discussion of the purposes for which these coatings are used. In addition, the inside two pages of the four-page folder feature a chart presentation of all the various Iridite coatings available.

The second new literature release by Allied Research is an eight-page discussion entitled "Practical Cyanide Zinc Plating."

L—506. SPOTLESS DRYING—Information concerning the newly patented Trisec process, developed abroad by Imperial Chemical Industries, Ltd., is available in Bulletin 24 from the Phillips Manufacturing Co.

Designed to replace costly convention methods of drying, Trisec is a drying solvent containing trichlorethylene and is especially suitable for spot-free drying of intricately shaped parts with cracks and crevices after electroplating, phosphating, chromating, electropolishing, contour etching, acid pickling, bright dipping and alkaline de-rusting.

L—507. WASTE TREATMENT—A five-pronged start-to-finish package is claimed to be the most complete waste treatment service available. Developed and described in a bulletin by Industrial Filter & Pump Mfg. Co., the service is called the "800 Series Inorganic Waste Treatment Program." It covers everything from original diagnosis to final disposal. It includes 1) Preliminary survey service, 2) Pre-designed package plants, 3) Compact custom designed plants, 4) Installation service, 5) Continuing monitor service.

L—508. DEBURRING, BUFFING, POLISHING—A new 20-page, two color, 8½ by 11-in. illustrated catalog describing a complete line of semi-automatic machines for low production deburring, buffing and polishing operations; and newly developed accessories and attachments for increasing efficiency of semi-automatic finishing operations is now available from Acme Manufacturing Co.

Also included in the catalog are 12 special semi-automatic polishing and buffing machines designed for specific application requirements such as reflector and bowl shaped parts, electric fry skillets, stainless steel sinks, die cast handles, bicycle rims, round and square tubing and shafts and rolls.

L—509. ELECTROPLATING PROCESSES—H-VW-M announces the availability of a new edition of its Electroplating Processes bulletin. The 24-page, two color new edition, EP-103, is an expansion of EP-102 issued last year. Nineteen plating and other metalfinishing processes and procedures are described.

Solution preparation, type of deposits, operating conditions, equipment required, and applications are listed for each of the processes.

Processes covered are H-VW-M Alcond DX-100, a de-smutting or deoxidizing solution for aluminum; Copper-Lume, a smooth bright copper process; Levelume 220, the improved Levelume—fully bright nickel deposit; Nickel-Lume, a fully bright nickel process; Permalume, the latest semi-bright process that can be continuously carbon treated; Superlume, bright nickel bath; Nickel Sulfamate, producing dull to semi-bright deposits—hardness range 200–600 VHN; Ni-Plex, a nickel stripper; Silver-Lume; and others.

L—510. EPOXY FILTER SYSTEMS—One-page Bulletin 802 of Sethco manufacturing Co. contains technical description and prices of the "all-epoxy" centrifugal filter systems designed for depth filtration of the common acid and alkaline aqueous solutions and solvents to microscopic clarity at high-flow rates.

These portable units feature all-epoxy construction which has excellent chemical and heat resistance to 250F, with rated capacity from 300 to 2700 GPH

L—511. CLOTH POLISHING WHEELS—A condensed catalog of its cloth polishing wheel line has been issued by Divine Brothers Co. The four-page, illustrated brochure includes descriptions and specifications of general-purpose Clothflex wheels, specially-bonded Superflex wheels and Divine's patented Non-Streak models. Bushings and balancing tubes for extending wheel life also are covered in the condensation.

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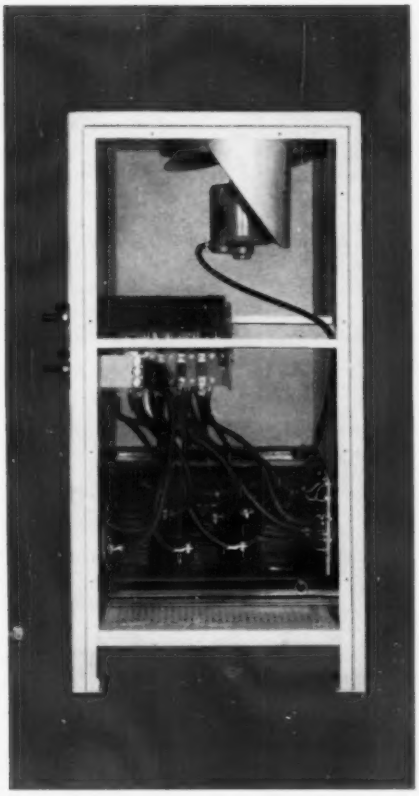

Now's the right time to let Udylite electrical equipment specialists rebuild your old, inefficient, 6-, 9- and 12-volt UM and UV rectifiers. You can obtain all of the advantages of a completely new silicon unit at a cost just slightly more than a silicon diode replacement kit. With the exception of the transformer, you'll have *a brand new rectifier from top to bottom* for greatly improved plating efficiency and extra-long service life.

NEW, MODERN CABINET in an attractive, two-tone, rust-resistant finish features slotted side panels for easy removal and replacement.

UNIFRAME CONSTRUCTION gives increased ruggedness, reduces overall weight.

NEW DIODE ASSEMBLY has newly-designed, one-piece, solid copper, finned heat sink and improved, non-aging silicon diodes with ceramic insulation and individual fuse protection.

NEW VENTILATION SYSTEM with new fan-housing assembly and permanent, built-in baffling assures highest ventilation efficiency.

NEW, LOW HEIGHT saves space. D.C. terminals are located in same relative position, thus new bussing is not required for re-installation.

All transformers are full-load tested before and after re-manufacturing. They are re-varnished and provided with new insulation on secondary leads. The Udylite Project Alert factory conversion program is designed to boost the efficiency of all your old UM and UV Rectifiers at a new, low cost. It will pay you to investigate its many benefits today. For factory conversion of other old-style Udylite Rectifiers to economical silicon units, contact your local Udylite Representative.

Silicon Conversion Kits

Udylite Silicon Diode Kits are also available for UV and UM rectifier conversion right in your plant. A specially fabricated heat sink assembly, complete with diodes and fuses, permits fast, easy installation.

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INDUSTRY NEWS

STEVENS MOVES TO LARGER QUARTERS IN BUFFALO

As part of an expansion program designed to improve its ability to serve metal finishing and foundry customers in New York and Pennsylvania, Frederic B. Stevens, Inc., has moved its Buffalo plant and warehouse from 93 Stone Street, where it was located for 26 years, to 597 Northland Avenue.

These new buildings contain more than 25,000 square feet of warehousing space and will enable Stevens to make shipments of foundry and metal finishing supplies direct from inventory.

BAKER BROS. TO HOLD OPEN HOUSE

Baker Bros., Inc. of Canton, Mass. is planning an open house during the week of the AES National Convention in Boston, to be held on Tuesday, June 20. Refreshments will be served and door prizes will be given. Chartered buses will leave from the Statler Hotel at 1:30 p.m.

It is anticipated that equipment will be in operation under full load conditions. An informal auction of one piece of equipment will be held, with all proceeds to be given toward Cancer Research.

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OLIN RESEARCH CENTER DEDICATED

In ceremonies marking dedication of the Olin Research Center in New Haven, Conn. on March 20, Olin Mathieson Chemical Corporation disclosed a breakthrough in industry's long search for a commercially practical way of making aluminum from common clay, progress on a new tough plastic with bullet stopping capabilities, and a wide range of research projects.

At a luncheon at the New Haven Lawn Club, where Mayor Richard C. Lee proclaimed New Haven Research Week, Dr. William E. Hanford, Olin vice president for research, reported the company's metallurgical scientists have developed, through the pilot plant stage, a process for purification of aluminum sulfate "which puts us one step closer to having a commercially feasible process for producing alumina from clay."

There are approximately 600 scientists, engineers and technicians at the $7,500,000 Olin Research Center. During the past two years, Olin has spent nearly $3,000,000 on improvement of facilities and consolidation of these activities at New Haven.

INVITATION TO AES BRANCHES TO HOST 1967 AES CONVENTION

Under its recorded policy whereby it chooses AES National Convention site and Host Branch six years in advance, the Supreme Society, AES's summit governing council, will select, at its Annual Meeting, Boston, Massachusetts, June 22, 1961, the site and Host Branch of the 54th Annual Convention of the Society to be held in 1967.

Any AES Branch wishing to be considered by the Supreme Society as possible Host of that 1967 Annual Convention is invited to have its documented invitation in the hands of the National Executive Secretary by or before June 1, 1961 for the preliminary consideration of the Executive Board at its meeting on June 18.

Interim Meeting sites, moreover, are now chosen by the Supreme Society two or more years in advance. Any AES Branch desiring Supreme Society consideration as possible Host Branch of the 1963 Interim Meeting is urged to have its documented invitation in the hands of the National Executive Secretary by or before June 1, 1961.

MANAGEMENT TRAINING SEMINAR FOR DIVERSEY DISTRICT MANAGERS

Six Diversey Corporation district managers recently attended the first of a series of management training seminars at the company's Chicago headquarters. Sales training director C. W. Long said that the seminars will continue until all 26 Diversey district managers have participated.

Purpose of the program is to review basic functions of management, the manager's responsibilities, selection and training of sales personnel, and leadership development.

Attending the first seminar were L. H. Barnes, Lansing, Mich.; R. B. Beattie, Pittsburgh, Pa.; W. B. Drake, Grosse Point Woods, Mich.; W. R. Johnson, Birmingham, Ala.; R. J. Seroogy, Haddonfield, N. J.; and I. R. Sheriff, Bemidji, Minn.

♦

H-VW-M LICENSES BRITISH MANUFACTURER

Hanson-Van Winkle-Munning Company has announced that it has signed a licensing agreement with Albright & Wilson (Mfg.), Ltd., of Oldbury, England.

One of Britain's largest chemical producers, Albright & Wilson was named in the agreement as sole licensee for the manufacture and sale in the British Commonwealth and certain European countries, of H-VW-M's complete line of metal finishing equipment, including buffing compounds and specific electroplating and electrochemical processes. Under the terms of the contract, Australia, Canada, Hong Kong and New Zealand are excluded.

The new agreement between the two companies broadens an earlier one under which Albright & Wilson is licensed to sell in the British Commonwealth well-known H-VW-M proprietary processes. These processes are sold under Albright & Wilson's own trade names. This earlier agreement has been in effect for the past three years.

Although Albright & Wilson has been in the metal finishing industry for many years with its own line of chemical polishing solutions and electroless nickel coatings, the agreement with Hanson-Van Winkle-Munning gives Albright & Wilson for the first time, a complete line of metal finishing equipment and supplies.

Albright & Wilson, Ltd., with annual sales of $100,000,000, is among the largest chemical manufacturers in the United Kingdom.

"By plating this part with LEVELUME 220 we slashed polishing time in half"

says JOSEPH T. HINES, Plant Manager, Southern Finishers, Inc., Nashville, Tenn.

A 50% reduction in the time it takes to polish this griddle cover is only *one* of the reasons Southern Finishers, Inc., is so enthusiastic about Levelume 220. This plater of some 500 different parts has cut polishing time one-quarter in *over-all* operations. Copper plating and copper buffing have been done away with on the griddle part and many others—saving up to two steps in seven.

"Appearance is better, too," says Joe Hines, a plater for 16 years. "Levelume 220 hides scratches nicely, plates brighter in recessed areas than any bath I've ever seen."

Southern is plating parts from ½-inch faucet buttons to 64" x 25" wire racks. What will Levelume 220 do on what *you're* plating? Ask H-VW-M.

H-VW-M *Progress in metalfinishing through advanced processes • equipment*

Hanson-Van Winkle-Munning Company, Matawan, New Jersey • Offices in Principal Cities
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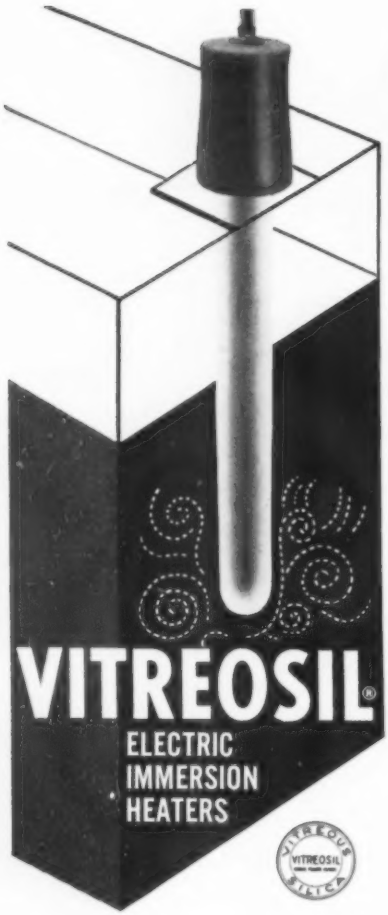

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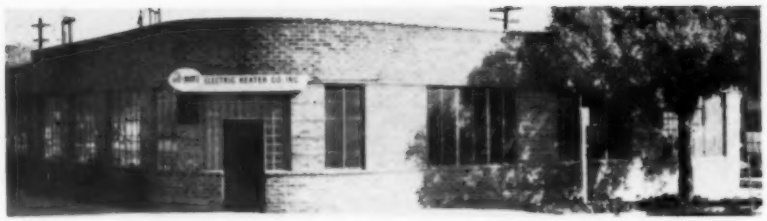


GLO-QUARTZ WESTERN DIVISION IN NEW PLANT

Glo-Quartz Electric Heater Company's newly created Western Division manufacturing plant is now located at 188 North Berkeley Ave., Pasadena, Calif.

The company moved to this new location on February 1, 1961, from its old location at 6110 Ferguson Drive, Los Angeles, Calif.

The new location consists of 7,000 square feet and the entire plant is air conditioned and of brick construction.

Specialized machinery and equipment have been installed for the manufacture of all types of electric heating devices.

Also being manufactured at this location is a complete line of quartz and metal immersion heaters that are used in the plating and metal finishing fields; and quartz infra red bake ovens used in general industries.

KOLENE NAMED LICENSEE FOR GERMAN PROCESS

Kolene Corporation has been named as exclusive licensee for the Tufftride process in the United States and Canada. This German-developed nitriding process is accomplished quickly at comparatively low temperatures.

Kolene is setting up Tufftriding facilities in the plants of both individual companies and commercial heat-treaters. They will also maintain operating facilities in their Detroit plant for treating sample parts submitted by manufacturers in all metal-working industries.

FIDELITY TO DISTRIBUTE CURTISS-WRIGHT ULTRASONIC CLEANERS

Fidelity Chemical Products Corporation of Newark has been appointed as a distributor to electronic and industrial concerns for the Curtiss-Wright line of ultrasonic cleaners. The decision to handle the Curtiss-Wright cleaners resulted from the close association of Fidelity's cleaning and descaling products and the applications for the cleansing units.

Packer buffing machine, specially designed for a weight-buffing operation of Fisher Scientific Co., takes over once the spindles are loaded and the motors are started. Here the operator starts the motors and observes the revolving table, the rotating spindles, and the rotating buffs, to check results and make adjustments in speed or pressure. In the left foreground are three rows of freshly-buffed 20-gram weights. On the center of the workbench sit dull 100-gram weights, waiting to be buffed, while a few finished 100-gram weights are shown in contrast to the right.

AES LAPEL BUTTONS

The AES member's handsome sterling silver lapel button can be purchased from your Branch Secretary at $1.38 per button including tax. These, in turn, can be purchased by Branch Secretaries from National Headquarters at that amount. The silver Branch Past President's button can be purchased by Branch Secretaries from the National Office at $1.43 per button including tax.

For cleaning these sterling silver buttons, here is one expert member's reported method, "Place hot water in which a little washing soda has been dissolved into an aluminum pan or any container with a small piece of aluminum at bottom (concentration: one tablespoonful of soda to one quart of water). Immerse the button so as to touch aluminum, and allow to soak until tarnish disappears. Operation will clean but will not injure the silver."

INDUSTRY NEWS BRIEFS

SHIPLEY OPENS NEW WEST COAST OFFICE

Shipley Company Inc., of Wellesley, Massachusetts, has opened a new and larger West Coast sales and technical service office at 6399 Wilshire Boulevard, Los Angeles 48, California, according to Gene H. Weiner and James L. Baudreau, Western Sales Representatives.

The company will continue to maintain its Los Angeles warehouse.

♦

DUBOIS TO BUILD CANADIAN PLANT

DuBois Chemicals of Canada Ltd. (a wholly-owned subsidiary of DuBois Chemicals, Inc.) plans the immediate construction of a manufacturing plant in North York Township, Toronto.

The new plant promises to be the most modern industrial detergent plant in the country. It will be equipped to manufacture the complete line of DuBois products and will also contain modern laboratory facilities for formulation control, research and service to customers. It will have a shipping area capable of the simultaneous handling of multiple car and truck loadings. The land was purchased several months ago and is located on the Canadian Pacific Railway.

♦

RESEARCH ON TIN IN 1960

The Tin Research Institute's Annual Report for 1960 covers the activities of the Institute at Perivale, Middlesex, and of its offices in the United States, Canada and six European countries.

Technical conferences on various applications of tin in industry were held in Paris, Brussels, and Brunswick, Germany, during the year.

Some thousands of industrial users of tin received technical advice and help during the year and the Report mentions the main types of enquiries in five categories listed as: tinplate, tin alloys, solders, electrodeposition and compounds of tin.

The Report deals item by item with the progress of the researches in the various departments of the Institute. Among the new lines of work mentioned are: tin as a deliberate addition to steel and also in cast iron; aluminum-tin bearings; studies on tin-titanium-oxygen and on tin-titanium alloys; the structure of electrodeposited alloys; bright electrotin deposits; the reactivity of surface zones in steel strip used for tinplate; the influence of tin on the hardness of silver; and discoveries in the field of organotin chemistry.

♦

JOHNSON'S WAX TO INCREASE ACTIVITY IN COATINGS FIELD

Johnson's Wax has announced plans to increase sharply research and marketing efforts in support of the company's line of industrial coatings.

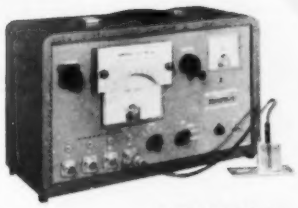
As an initial step, the 17 coatings produced by the company have been aligned into four major chemical groups. The coatings are formulated to protect a wide range of surfaces, improve product appearance, lubricate, or act as a mold release. There are types for nearly all metals, concrete, fiberglass, leather, paper, nylon, plastics, rubber, wood and hard board, according to the announcement.

♦

BERKSHIRE CHEMICALS SOLD BY VITRO CORP.

Malcolm H. McAllister, president of Berkshire Chemicals, Inc., New York City, has acquired the company from the parent Vitro Corporation of America.

Berkshire was organized in 1949 and has been a wholly owned subsidiary of Vitro since December 1956. Gross annual sales are approximately $3,000,000. In addition to headquarters in New York, there is a branch office in Chicago and an agency in San Francisco.



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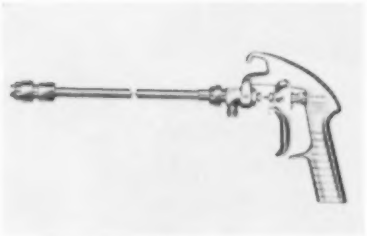
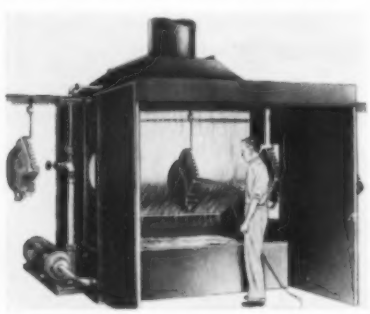


E—501. SPRAY GUN—Spraying Systems Co. has introduced a new line of No. 22 series GunJet Spray Guns to provide greater reach with drip-free shut-off. These 22HPSSTC-8980 GunJets for airless paint spraying are built in a choice of four models with extension lengths of 8, 18, 24 and 36 in. In each model the valve stem extends the entire length of the extension tube. The shut-off needle is positioned immediately behind the nozzle orifice said to assure positive, drip-free shut-off.

E—502. PLASTISOL COATING—A new plastisol coating has been announced by Belke Manufacturing Co. that is claimed to withstand trichlorethylene degreasing compounds. It is also said to resist plating solutions.

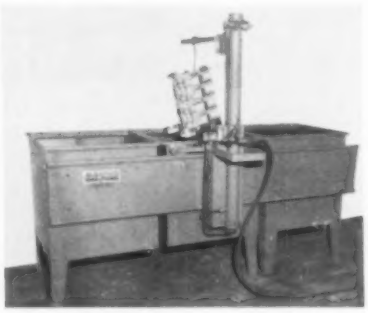
E—503. PAINT SPRAY BOOTH—A new line of economy water-wash paint spray booths designed to give production-line economy and efficiency on short runs was announced by Despatch Oven Co.



The new line, named Thrift-Flow, uses nozzle sprays with overlapping patterns to achieve high-speed removal of paint pigments and volatiles.

Use of these booths are claimed to allow small and medium sized finishing departments production facilities comparable to those of large operations.

E—504. TRAMWAY—Magnus Chemical Co.'s Porto Lif "tramway" for all multi-tank cleaning is a low-cost, 75-lb capacity, lever controlled, pneumatically operated unit that provides 100 to 140 up-and-down motions per minute in the cleaning solution. The agitation of the suspended, basketed or platformed parts in the solution combines the action of the cleaning solution with the dirt-shearing action of the agitation.

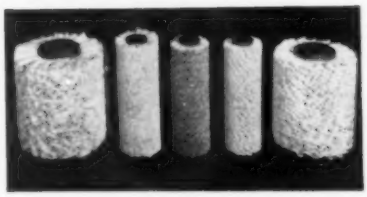


Work to be cleaned is loaded on the platform of the Porto Lif at floor level, eliminating manual lifting or the use of overhead hoists. The unit shown is for two stages; wash and rinse. It can be adopted to perform any number of operations such as pre-wash, wash, rinse, anti-rust and dry.

E—505. THERMOELECTRIC PROBE—A thermoelectric probe, Model TE-1, to detect differences between metals, their alloys and electrodeposited metallic coatings by means of their thermoelectric power is announced by Electro Impulse Laboratory, Inc. The test is non-destructive, and is claimed to be quick and simple.

E—506. JET-SPRAY PROCESS—Kolene Corp. has announced the development of a jet-spray process for applying molten salt to continuously moving strip to automatically clean metals without scratching them. Because of the finishes now specified for automotive trim, appliance components and architectural features, this process will have particular importance in the descaling of stainless-steel strip, states the manufacturer.

Advantages of the jet-spray process can now be added to the regular Kolene salt-bath. Kolene No. 1 (a molten salt with efficient oxidizing properties) converts the annealing oxides into soluble oxides that are removed easily in the electrolytic acid-pickle.



E—507. BUFFING WHEEL—The Geo. R. Churchill Co., Inc. announces a new type of buffing wheel design. It is called the Churchill Spyri-Roll buff and is made from one continuous strip of buffing element or material. The element can be either the Churchill Finger type or the standard bias type—either cloth or sisal and in various densities as desired.

The continuous spiral construction provides the advantage of performing a double cutting action by the buffing element. The buffing element rotated against the work provides one cutting action while its sideways movement, due to its spiral or helical construction, provides the second cutting action.

The Spyrl-Roll buff is provided in cartridge form ready for immediate use, and key ways are provided for mounting on the shaft to prevent slipping.

E—508. ACID INHIBITOR—A new acid inhibitor for sulfuric, sulfamic, phosphoric or citric acids in metal cleaning and pickling has been introduced by Armour Industrial Chemical Co.

A new liquid inhibitor, tradenamed Armohib 31, is an aliphatic nitrogen compound which is claimed to be readily soluble in acid at use concentration and will not precipitate or cloud on use or standing.

E—509. PLATING UNIT—A compact plating unit measuring 30 by 26 by 18 in. to the work top contains all the equipment and features for precision-plating of jewelry, electronic parts, specification precious metal plating, or "pilot plant" set-ups, according to an announcement from The Meaker Co., subsidiary of Sel-Rex Corp. A completely re-designed smaller version of this firm's Jet Plater, the new models are said to permit either barrel or rack plating with any cold alkaline solution, and most acid plating solutions, on a mass-production basis.

The Meaker Co. states the new Junior Jet Platers provide the ideal operation for

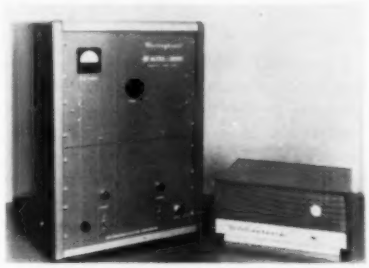
precision-plating: i.e., a plastic centrifugal pump in conjunction with a vinyl, jet orifice manifold at the bottom of the plating tank, causes the plating solution to swirl constantly around the work, assuring smooth, even deposits. In operation, the solution is continuously drawn off from the bottom of the tank, circulated through the pump and built-in filter, and returned to the tank under pressure.

Reportedly, all operations are controlled from a convenient panel board which incorporates dual scale ammeter, powerstat control for rectifier, circuit breakers, and automatic timer which sounds alarm upon completion of plating cycle.

E—510. ULTRASONIC CLEANING GENERATOR—Another advance in solid state ultrasonic cleaning equipment has been announced by the Westinghouse Electric Corp. with the development of a new one KW generator whose size has been cut 75 per cent and weight reduced by more than 50 per cent over present tube models.

At the same time, it was revealed the unit will feature the new Westinghouse Magnatrak circuitry.

Elimination of a tuning knob, a meter and one fuse from the generator now requires an operator simply to use the on/off switch control to instantly begin cleaning a part or component. No warm-up time or tuning is required.



Also the completely-new design means the generator will require 25 per cent less power yet result in a significant increase in reliability and performance.

E—511. SPRAY CLEANER AND PHOSPHATIZER—A new spray cleaner and phosphatizer for ferrous metals has been announced by The Diversey Corp.

Designated Diverfos F-72, the compound conforms with U. S. Military Specifications MIL-C-490A for Grade III process. It is said to be a free-flowing, readily soluble granular compound.

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PERSONALS

O. IVAN KIMBALL has joined Alco Chemical Corporation of Dearborn in charge of special accounts and the technical department. Mr. Kimball formerly had been associated with General Motors transmission division as chemical engineer and as instructor at Ford Motor Company Rouge and the Brazilian Air Ministry.

O. I. Kimball

Dr. A. Brenner

DR. ABNER BRENNER has been awarded the Hothersall Memorial Medal for 1961 and will deliver the Hothersall Memorial Lecture at the Twelfth Annual Metal Finishing Conference of the Institute of Metal Finishing at Llandudno, Wales on May 4. A staff member of the National Bureau of Standards since 1930, he is now chief of the Electrodeposition Section. He is a member of the Baltimore-Washington Branch of AES, the Institute of Metal Finishing and the Electrochemical Society. An author of many technical papers, Dr. Brenner is a former member of the Editorial Board of PLATING MAGAZINE.

♦

ROBERT W. LINDSAY has been appointed as head of the department of metallurgy of The Pennsylvania State University at University Park, Pennsylvania. He succeeds Amos J. Shaler who has resigned from the Penn State faculty.

Dr. Lindsay received the BS degree in chemical engineering from Tufts University, and the SM degree in metallurgy and the ScD degree in physical metallurgy from the Massachusetts Institute of Technology. Prior to his initial appointment to the Penn State faculty in 1943, Dr. Lindsay held industrial research positions in cast iron research with the Association of Manufacturers of Chilled Car Wheels at Chicago and with the Sealed Power Corporation at Muskegon, Michigan.

From 1943 to 1957, he held the successive appointments of assistant professor, associate professor, and professor in the department of metallurgy at Penn State. He left Penn State in 1957 and joined the Central Research Laboratory of the Crucible Steel Company of America at Pittsburgh as research supervisor, constructional alloy steels. He returned to Penn State in 1959 as professor of metallurgy and served as acting head of the department of metallurgy while Dr. Shaler was on leave.

♦

ALLAN L. LENIO has received appointment as product manager, metal finishing, of Kelite Corporation.

In this position, Mr. Lenio will be responsible for the development of metal finishing sales in the mid-western sales region.

Mr. Lenio has had twelve years experience related to the metal industry. This includes fabrication, technical sales, and management. He studied chemistry at Seton Hall University. He is a member of the American Electroplaters' Society and the Midwest Enamelers Club.

Kelite's Chicago facility will be Mr. Lenio's headquarters.

A. L. Lenio

J. Garland

JAMES GARLAND has received appointment as a sales representative for Western Pennsylvania for the Metal Finishing Division of Frederic B. Stevens, Incorporated.

Before joining Stevens, Mr. Garland was employed for nine years as department head of analytical chemistry at The Coraopolis Division of Rockwell Standard Co. He is a graduate of The University of Pittsburgh and holds a BS degree in chemistry.

He is a member of The American Electroplaters' Society and The National Association of Corrosion Engineers.

♦

ACTOR H. PATTON has been promoted to director of product development for Allied Chemical's General Chemical Division.

With the division 32 years, Mr. Patton has been manager of product development for the past eleven. Earlier he served as sales manager of General's "Baker & Adamson" line of laboratory reagents and fine chemicals, and as manager of its New York Metropolitan and St. Louis sales offices. He is an alumnus of the former Case School of Applied Science (now the Case Institute of Technology) with a BS degree in chemical engineering.

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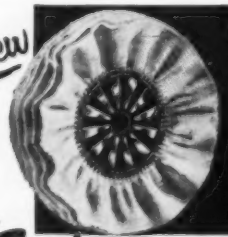

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EDMUND HORNER has been appointed research chemist by MacDermid Incorporated. He has been assigned to the research laboratory in the Waterbury plant. Before joining MacDermid, Mr. Horner was employed by the Oakite Co., first in the technical service department and later in the research department.

He is a graduate of Polytechnic Institute of Brooklyn with a degree in metallurgical engineering and a member of both the American Society for Metals and National Association of Corrosion Engineers.

E. Horner

J. R. Edmonds

JOHN R. EDMONDS has been named director of production for Allied Chemical's General Chemical Division. With the division 21 years, Mr. Edmonds has been product manager for a group of industrial chemicals for the past three years. Earlier he served as superintendent of General's plant in Buffalo and in technical capacities in other General Chemical plants. Mr. Edmonds is an alumnus of the University of Illinois.

♦

GEORGE C. RAYNER has been appointed assistant to the president of Allied Chemical's General Chemical Division.

Mr. Rayner, with the division 30 years, will direct special projects.

♦

JAMES E. SPENCER of the Harshaw Chemical Co. has been elected vice president of The Salesmen's Association of the American Chemical Industry. He fills the vacancy left by Charles E. Griffith of R. W. Greeff & Co. who has moved up to the presidency.

ISIDORE FRIEDMAN has joined the DeJur-Amsco Corporation as manager of the Vernon Plating Works, Woodside, L. I., a subsidiary.

Mr. Friedman comes to his new position from the E. C. Electroplating Co. Garfield, N. J. where he was technical director and manager of the Precious Metals Plating Division. There he gained an extensive background in precious metal plating for the electronics field.

Previously, Mr. Friedman had been the head of the plating and surface treatments unit of Wright Aeronautical Division, Curtiss Wright Corp. He was involved in the development of procedures for plating on molybdenum and titanium, holding a patent on the latter. He was instrumental in the introduction of the sulfamate bath for low stress nickel plating to the aircraft industry

A graduate of C.C.N.Y., Mr. Friedman served with the Army in World War II. He is the Financial Secretary of the New York Branch of the AES.

♦

GUS MARTIN has joined the organic research group at Metal & Thermit Corporation's research laboratories in Rahway, N. J.

Mr. Martin received his BS in chemistry from Iowa State University, and has taken graduate study at North Carolina State. He is a member of the American Chemical Society.

♦

JOHN M. PEABODY has been appointed to handle Northwest Chemical Company accounts in the Youngstown and Pittsburgh areas.

Mr. Peabody has been given special training in the application of Northwest products, both in metal plating and organic finishing. His broad industrial experience and chemical engineering training equips him to work on the line with production men.

He will work out of the home office at 9310 Roselawn Avenue, Detroit, Michigan.

EDWIN ROOF was announced as general manager at the March 6 annual meeting of Varland Metal Service, Inc.

Mr. Roof is a 1943 graduate of the University of Cincinnati's cooperative course in chemical engineering and has been associated with Varland Metal Service, Inc. as vice president and chemical engineer since the founding of the electroplating company in 1946. He is a member of the American Electroplaters' Society and served as President of the Cincinnati Branch in 1956–57.

E. Roof

R. H. Bobilin

ROBERT H. BOBILIN has joined Imperial Industries, Inc. Mr. Bobilin's former associations include the Udylite Corp. and F. B. Stevens Co. He brings to Imperial Industries wide experience in the electroplating and chemical processing fields.

♦

PAUL A. WAALKES has been elected as a director and appointed a vice president of Alert Supply Company.

Mr. Waalkes continued to be sales manager of Alert Supply and he had previously been assistant general manager of the J. C. Miller Division, Hanson-Van Winkle-Munning Company, Grand Rapids, Michigan.

Alert Supply Company is a wholly-owned subsidiary of Hanson-Van Winkle-Munning Company, Matawan, N. J.

♦

ARTHUR D. GASKIN, one of the founders of the Alert Supply Company, retired as vice president effective March 15.

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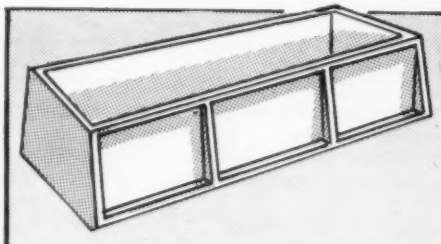

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BRANCH NEWS

Total AES Branches U. S., Canada, Australia, May 1, 1961—60.

BLUE RIDGE
Taylor Speaks on Detergency in Cleaners

The Blue Ridge Branch held its regular monthly meeting March 3 at the Barringer Hotel in Charlotte, North Carolina. Thirty-three members and guests attended the first meeting ever held by the Branch in Charlotte. **Bruce Wallace,** Branch president, presided over the meeting.

At the business meeting the president appointed **Ted Boggess, Herb Norris** and **Walter Conine** as members of the nominating committee for the 1961-1962 year. They will report at the April meeting.

A discussion was held concerning the sponsorship of student memberships in the AES by the Branch. A motion was made to sponsor ten such memberships. This was approved by vote of the members. These memberships will be given to students who have shown an interest in the electroplating field and who have been nominated by the department head for this honor.

Seven new members were elected.

After the business meeting, those attending heard **Dr. A. L. Taylor** speak on "Detergency in Cleaners." Dr. Taylor is with MacDermid, Inc.

Donald H. McGee
Secretary

BUFFALO
Membership Quota Met; Hall Discusses Electrofabrication

The Buffalo Branch held its monthly meeting on Friday, March 3 at the Niagara Manor, Buffalo, N. Y. with 26 members in attendance.

First Vice President **John Donaldson** called the meeting to order.

George Wolf, the Technical Societies' Council representative, reported on the progress of the forthcoming Science Fair.

John Donaldson, chairman of the Membership committee, reported a letter was sent to each Branch member asking for their co-operation in obtaining new members and that to date we have met our 10 per cent increased membership quota.

A motion was made by **Ray Blechinger,** seconded and carried that henceforth the dinner served prior to our monthly meeting will be served on individual request rather than buffet style.

Librarian **John Tiebor** introduced the guest speaker of the evening **Nathaniel Hall,** technical editor of *Metal Finishing* magazine.

Mr. Hall, with the aid of samples, presented a very interesting talk entitled "Electrofabrication"—the use of electrodeposition to produce metal objects.

R. Eich
Secretary

CAPITOL DISTRICT
Fitzgibbons is Speaker; June Outing Planned

The February 6 meeting was held at Circle Inn, Latham. After a chicken dinner the regular meeting was held.

Fred Infield got a tentative date for the outing at Endries in June.

Robert Hill announced everything was set for the joint meeting with Mohawk Valley Branch for the tour through the Watervliet Arsenal on Monday, April 3 at 7:00 p.m.

After the meeting **Jack Fitzgibbons** of Knolls Atomic Power Lab gave a very interesting and educational talk on radioactivity.

Edward Legere

CAPITOL DISTRICT
Lines Addresses Joint Meeting with NACE

The March 1 Meeting was held at the Circle Inn, Latham. This was a joint meeting with the National Association of Corrosion Engineers.

There were about 20 members present at the meeting. **John Green** and **Nick Calantone** were appointed as the nominating committee for the 1961-1962 officers.

Wilson Lines of the research department of Revere Copper and Brass gave a very interesting talk on "Corrosion of Copper and Copper Alloys and its Prevention."

Edward Legere

CHICAGO
Kerr Presents Aluminum Finishing

The Branch held its regular monthly meeting on Friday, March 10 at Petricca's Restaurant, 510 North Western Avenue. One application for membership was received and turned over to the Board of Managers for approval. **Paul Glab** urged the members to attend the meeting at Rockford on Saturday for a good program is to be presented with some of our Chicago members on the panel. **Clyde Kelly** gave a report on the Interim Meeting which was held at Hartford.

Joe Andrus and **Christopher Marzano** have completed the arrangements for "Ladies Nite." The affair will be held at Remick's Lilac Lodge, 22nd and Wolf Road in Hinsdale, Illinois, on Saturday, April 8. Cocktails will be served from 6:00 to 7:00 p.m. with dinner being served about 7:15 p.m. Door prizes will be awarded, and distributed by **Rudy Hazucha. Dick Connors,** chairman of the new membership committee, will mail letters to job and captive shops to stimulate new members to join the Branch.

The slate of officers for the coming year were unanimously elected by the members present at the meeting. Rudy Hazucha, president; **Joseph C. Corre,** first vice president; **Art Bartman,** second vice president; **Paul Glab,** secretary-treasurer; **Charles Geldzhaler,** librarian; Board of Managers, **Matt Dassinger,** chairman; **Robert Waits, Charles Jensen, Willard Carter** and Christopher Marzano. Delegates, **Si Gary,** Paul Glab, and Clyde Kelly; Alternate Delegates, **Scott Modjeska, Charles Geldzhaler** and **Matt Dassinger.**

The speaker of the evening was **Jack B. Kerr,** finishing engineer with Reynolds Metals Company, who spoke on "Finishing Aluminum." The four categories which Mr. Kerr was to discuss were (1) anodizing, (2) plating, (3) porcelain enameling and (4) painting on aluminum. To anodize properly the following points must be considered: (1) the proper alloy must be used, for example: for high reflectivity the 5357, 5457 and 5557 series; for store fronts and architectural work 3003, 3005, RF3135; 2000 series copper bearing alloy for aircraft use. (2) Good electrical contact must be made on the rack so as to prevent the parts from falling off the rack. (3) The part must be clean, free from oil or grease. (4) The anodizing bath must have a constant and uniform temperature. (5) The parts must be properly sealed after anodizing in distilled or demineralized water and the temperature not lower than 208F.

The processing for anodizing is as follows: (1) hot alkali cleaner dip, (2) desmutter or deoxidizer dip to remove oxide and silicate from surface of aluminum, (3) for reflectivity the parts are chemically brite dipped or the parts get an etch in hot alkali at 140F to produce a dull sur-

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

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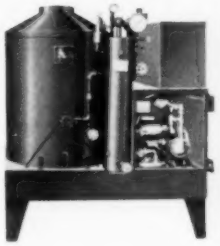

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face, (4) acid dipped in strong nitric acid from 35–50 per cent to remove smut from surface, (5) anodize in 16–20 per cent by weight sulfuric acid at 12–15 amp/sq ft. The time may range from 10 minutes to give 0.0003 coating or one hour for thicknesses ranging from 0.0008–0.001. The tank may be lead-lined, 316 stainless steel, rubber or tygon lined and lead used as cathodes. (6) Seal in hot water for clear anodize, or dye tank for color. The dyes to color the anodize are organic while the gold and black dyes are inorganic. Mr. Kerr interjected humorous remarks on the matching of dye colors on anodized work. Ferric ammonium oxalate is used to produce a gold color on anodized work at a temperature of 120F and a *p*H from 3.4–4.7 with mechanical agitation. To obtain a white anodize coat, (1) oxalic acid is added to the sulfuric acid bath, (2) use A.C. current or the (3) chromic acid bath.

Porcelain enameling of aluminum is used extensively for highway signs because the finish is not affected by rain, snow, dust, sunlight and doesn't flake off the surface. Enamel finishes are abrasion resistant, available in a variety of colors, durable and hard. Gold is plated on aluminum for missile application and with silver for electrical contacts. To paint aluminum the surface may be etched, abrasive blasting, phosphate or chromate conversion coatings or chromic acid anodizing. Any of these processes will produce an excellent paint-base for alkyd-amino-type paints; vinyls or epoxy type finishes. Mr. Kerr was given a rousing vote of applause for his interesting and informative talk.

Christopher Marzano
Publicity Chairman

CINCINNATI

Helbig Talks About Activated Carbon

Annual elections were held during the March 22 meeting of the Branch. The officers for the coming year are: **Gerard H. Poll Jr.,** president, **Charles Dumont,** first vice president; **Robert L. Winston,** second vice president; **Richard K. Evans,** librarian; **Gordon T. Speers,** treasurer and **David L. Kaplan,** secretary. **Bill Stephenson** and **John Stary** were appointed to the Auditing Committee. **Clyde Seymour** reported that the Annual Picnic will be held at the Farm on Anderson Ferry Road, August 19, from 1–10 p.m. and the cost for tickets will be $4.

Walter Helbig of Atlas Powder Co. discussed Activated Carbon, its manufacture and uses. The manufacture of activated carbon begins with the strip mining of Lignite which is then destructively distilled, activated and the solids are then ground, acid washed and desulfided. The final product is a material with an adsorption surface of 50–125 acre/lb of mass and free from contamination.

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The group adjourned to the social hour sponsored by the McGean Chemical Company, **Alan Klonne** as host.

David L. Kaplan
Secretary

DENVER
Shwayder Plant Tour Conducted by Jenkins

The Denver Branch met for their monthly meeting March 10 at Shwayder Brothers, Inc. for a plant tour. Following dinner a short business meeting was held. The nominating committee presented a slate of officers for the coming year. The election of two members was also announced.

Following the meeting **Jim Jenkins** of Shwayder Brothers took charge and conducted the group on a tour of the plant. Of interest to the group were the metal plating facilities, bright dipping and anodizing of aluminum, forming of luggage frames and side, bonding of vinyl plastic to magnesium, and finally the assembly of the fabricated parts into suitcases.

Elmer Schuster
Secretary

DETROIT
Helbig Speaks on Use of Activated Carbon

The April 7 meeting was held at the Statler Hilton Hotel. Technical Chairman **Richard A. Fellows** presented **Walter A. Helbig** of Atlas Powder Co. who spoke on "Purification of Plating Solutions by Activated Carbon Treatment and Filtration."

The Detroit Branch will hold its annual Stag Day on July 22 at the Glen Oaks Country Club.

W. G. Anderson

A portion of the members of Detroit Branch who heard W.A. Helbig at the April meeting

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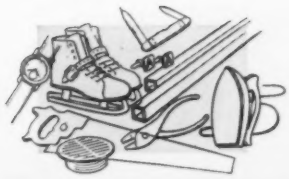

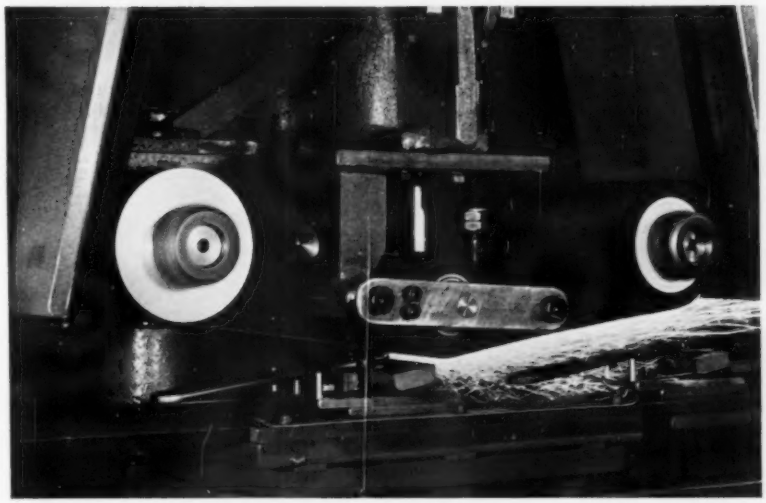

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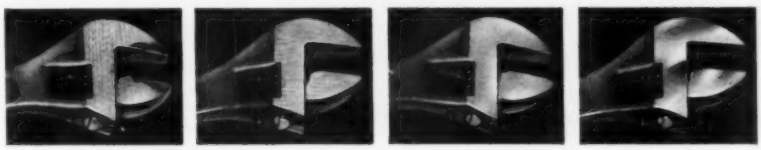

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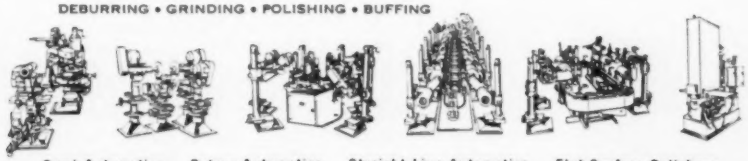

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GRAND RAPIDS

Shumacker Discusses Finishing; New Officers Elected

Friday, March 10, was election night for the Grand Rapids Branch.

The meeting was opened by outgoing President **Edwin Krook.** The members were told the annual party was a success financially.

The slate of officers nominated by the nominating committee, headed by **Wallace Reed,** was adopted without change.

The following officers were elected unanimously: President, **William J. Griffin;** first vice president, **Bernie Kumko;** second vice president, **John H. Wickering;** secretary, **William M. McGee;** treasurer, **William Walling;** librarian, **Coleman Peebles;** assistant librarian, **Siad Johns;** Board of Managers—Edwin Krook; Wallace Reed; **Lyman Sperry.**

A fine technical talk on Triclene Finishing was given by **Fred Shumacker** of E. I. DuPont de Nemours and Company.

John H. Wickering

INDIANAPOLIS

Visit to Japan Outlined by Blount

Ladies Nite was enjoyed by 53 members and their guests for dinner on Tuesday, March 7 at the Construction League. Other members attended the meeting later.

John Hood reported on the Interim meeting to which he was our Delegate. The business of the 25-year certificate of membership was one item of business. Another was to change the title of "Librarian" to "Educational Chairman."

Cards are being distributed to find out what subjects would interest the members for the Workshop in the near future.

Our speaker of the evening certainly gave us a surprise when he appeared dressed as a native from the country which he had recently visited. **Ezra Blount** appeared in full Japanese dress and acknowledged the introduction in Japanese words, the few that he knows. Mr. Blount spent three weeks in Japan, one week in Formosa and Hongkong. The economy of Japan was booming, as evidenced by all the new cars, homes, trains, buildings, etc. Many of the Japanese industrial plants are outfitted with American-made machinery as well as their own. Companies in the U. S. are getting ready to have parts made and plated in Japan.

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BRANCH LADIES AUXILIARIES

A view of the meeting of the Ladies Auxiliary of the Detroit Branch held at the Statler-Hilton Hotel, Detroit, April 7, 1961. Popularly known as the "Does" of the Detroit Branch, the ladies met at the same time as the Detroit Branch, with Mrs. Manuel Ben, President, presiding. The view at the left presents some of the ladies at the dinner preceding the meeting.

Government supported agencies do the research for industry.

There are vocational schools to train people to follow along wherever business is most prominent.

On plated products, Mr. Blount said there is a little less plate on the parts than what we put on, more copper than nickel. That is because copper is cheaper over there, nickel is very high in price.

There are societies for the electroplaters in Japan and all of them publish magazines. Mr. Blount showed several color films of the country and the people of Japan. They were indeed delightful and beautiful.

Edna Rohrabaugh
Secretary

LANCASTER

Color Anodizing Discussed by Darrow

The regular monthly meeting of the Lancaster Branch was held at Barbeque Cottage East, Harrisburg, on Friday March 10. In the absence of President **Sharretts,** Mr. **Geesey** presided.

Robert Plaisted, chairman of the nominating committee, reported the following nominations: President, George Geesey; vice president, **Martin Frant;** secretary-treasurer, **Joe Shockcor;** librarian, **Bruce Snyder;** Board of Managers—Paul Sharretts, **Clester Smith, Robert Plaisted.** Elections will be held at the April meeting.

An application for membership was read for the second time and approved.

The secretary was asked to prepare a questionnaire to be circulated to the members of the Branch covering preferred meeting nights, subjects for meetings next year and any other topics which would provide the officers with helpful information about the members' wishes. Martin Frant agreed to do so.

There were 21 members present.

Following the business meeting, the speaker was **G. R. Darrow,** a finishing engineer with the engineering services department of the Reynolds Metals Company. His topic was "Steps in Design and Control for Successful Color Anodizing." Mr. Darrow gave a thorough and detailed review of the problems in this field.

Martin Frant
Secretary

LOS ANGELES

Krueger Talks About Ultrasonics

The meeting was called to order by President **Frank Virgil.** Guests were introduced by Sergeant-at-Arms **Ozzie Grisat.**

President **Frank Virgil** accepted three new members into the Los Angeles Branch.

The nominating committee then listed the following as their selection of officers for the year 1961-1962: First vice president, **Harvey Hunt;** second vice president, **Don Boudrand;** treasurer, **Bob Pooler;** secretary, **Harold Wanamaker;** educational chairman, **Bill Pardee;** Board of Managers—Frank Virgil, **Norman Painter, Truman Stoner.**

Bill Thomas reported for the annual technical session and dinner dance committee. He urged all members and in particular salesmen who contact many shops to push the annual affair.

Don Boudrand introduced the guest speaker for the evening **Tom Krueger** of Acoustica Assoc. Inc., who gave a splendid

(Top) Participants in the Dayton Branch Annual Educational Session on March 4. L to r, William H. Safranek, Arthur H. DuRose, National President W. Andrew Wesley, Honorary Chairman; Dr. Hyman Chessin, General Chairman Harry Hadlock. (Bottom) Head table at Dayton 15th Annual Dinner Dance, from left, Mr. and Mrs. Safranek, Mrs. and Dr. Wesley, Mrs. and Mr. Hadlock, Mr. and Mrs. Byron A. Bowman, Dr. and Mrs. Chessin.

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For reference, see J. ELECTROCHEM. SOC. 103 p. 549 (1956). Reprints on request.

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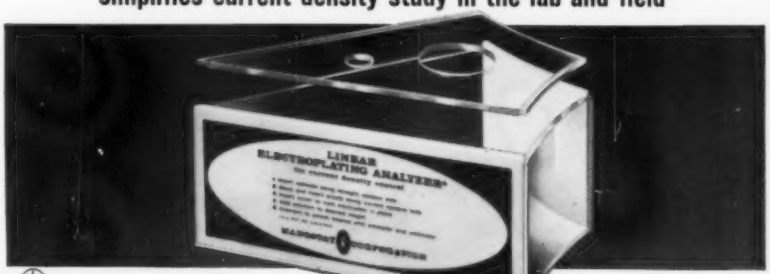

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talk on the "Principles and Applications of Ultrasonics." So varied were the examples of ultrasonics that a halt had to be called to questions from the floor. Ultrasonics was number one in our subject poll and Tom proved our poll right.

R. H. Pooler
Secretary

MELBOURNE

Melbourne Welcomes Bert Wallbank

The February meeting was held at the Royal Melbourne Institute of Technology. This was the Annual General Meeting and the following officers were elected for 1961. President, **I. W. Rose;** first vice president, **W. Regan;** second vice president, **K. Staggard;** honorary secretary, **G. Perkins;** honorary treasurer, **L. Esmore;** librarian, **A. Barratt;** Board of Managers, **J. Parker, J. Wright, B. Dixon.**

The Branch was honoured to welcome a speaker of international reputation. **John J. Dale** introduced **A. W. (Bert) Wallbank,** managing director of Ionic Plating Co., Birmingham, England, and recipient of the AES Carl Heussner Gold Medal. He addressed the meeting on "Plating in England Today." He described many aspects of his own plating shop including the various processes, choice of equipment, channeling of work, costing and works administration. Since this is one of the largest job shops in England, and because the speaker presented much detail, the lecture was crammed with interest for any plater. His use of monorail layouts gave extreme flexibility. His description of their barrel plating practice was most informative. The use of process chemists in the plant eliminated many troubles between the laboratory and the plant and provided a training ground for works foremen, research men, sales staff and executives.

During the discussion, questions were asked on the identification of batches throughout the plant and the size of an individual part before economy dictates that it should be plated in a barrel or still bath.

Mr. Wallbank described the use of identification tabs for batch baskets and the associated office system. He said that generally speaking, barrel plating was not used for parts over 2 in. in length.

The vote of thanks was moved by **Doug. Syme** and enthusiastically carried by the audience of about 55 members and visitors.

G. J. Perkins
Secretary

MIAMI

Branch Joins Technical Societies Council

The March 17 meeting was presided over by **"Duke" Dent** in the absence of **Earl Kennedy.**

It was voted to accept the invitation to join the South Florida technical societies council and **Fred Fulforth** was appointed to represent the Miami Branch on the council.

Tony Rotoli was appointed to be the AES representative to the local chapter of the ASM.

Nominating committee was appointed to bring in a slate of officers for the ensuing year. Appointed were **Jack Craig, Walt Donnelly** and Fred Fulforth.

All members of the Branch are requested to indicate their preferences as to subject matters that they would like to have covered in our educational sessions.

Motion was made by **Steve Putzan,** seconded by Fred Fulforth, and carried that ladies nite be set for the May meeting. Plans are being formulated for the regular meeting nite to have a dinner for the ladies, with a program that might be educational in nature but be presented in a manner that would be interesting to the girls, so that they will insist that the members attend all meetings.

In honor of St. Patrick's Day a special collation was served.

Abe Schorr
Secretary

MILWAUKEE

Sustaining Membership Night: Sample and Hunsaker Speakers

At its regular meeting on March 4, the Milwaukee Branch honored its Sustaining Members by entertaining their representatives at dinner.

After dinner, President **E. E. Piellusch** conducted a short business meeting during which two applications for membership were approved.

The nominating committee, consisting of **Herman Tessmann,** chairman; **Henry Bornitzke** and **Ted Sobczynski,** reported the following nominations for Branch officers: For president, **Arthur Linn;** first vice president, **Clinton Host;** second vice president, **Jack Auchter;** for secretary-treasurer, **Leslie Diveley;** for librarian and program director, **Curtis Hunsaker;** for manager, **Sy Taterzynski** for Delegates, Leslie Diveley, **Robert Steuernagel** and Herman Tessmann.

Curtis Hunsaker introduced **O. Leuhey,** head of the field training service school of the AC Spark Plug Co. Mr. Leuhey described some of the cleaning and finishing problems connected with the manufacture of inertial guidance systems. Illustrating his talk with a motion picture, the speaker described the different types of missiles and the extreme accuracy with which they must be guided, an accuracy that requires angular correction after take-off of less than a millionth part of a second of arc.

The second speaker on the program, **Clarence Sample** of the International Nickel Company, was also introduced by Mr. Hunsaker. Mr. Sample, long associated with the AES Research Program, described some of the many benefits the program has brought to the metal finishing industry. By means of projected charts, he demonstrated that the work of AES Research Project Committees has been much less than the cost of equivalent research done by private industry or government agencies.

MOHAWK VALLEY

Dvorin Explains Ion Exchange

President **Robert Stewart** opened the February 9 meeting at the Twin Ponds Country Club with 22 in attendance.

He reported that a large number of our members attended the funeral parlor to pay respect to **Walter Sackett** who died January 26. Flowers were sent on behalf of our Branch. A letter of appreciation was received from the family.

Attention was directed to the Boston Convention in June and members advised to start planning now for it.

A motion by **H. Crouse** and seconded by **Merle Ihrie** was passed to send Mr. Stewart to the coming banquet of the Mohawk Valley Engineers Society, the ticket to be paid by our Branch.

Librarian **Robert Krawczyk** introduced the speaker **Robert Dvorin** of Graver Water Conditioning Co. His topic was "Ion Exchange, a Practical Tool in the Plating Room."

Mr. Dvorin explained what ion exchange is and how it works. He gave several reaction formulas to emphasize the versatility of the process.

It was stated that water of higher purity than distilled water can be obtained by this method, as low as 2 to 5 ppm. Organic matter in the source water can be a problem by blocking the pores of units.

Where a waste treatment is required for sewage disposal this is a good tool. However, a survey of plant requirements must be made to determine whether economy can be made to justify the cost of equipment.

H. J. Crouse
Secretary-Treasurer

MOHAWK VALLEY

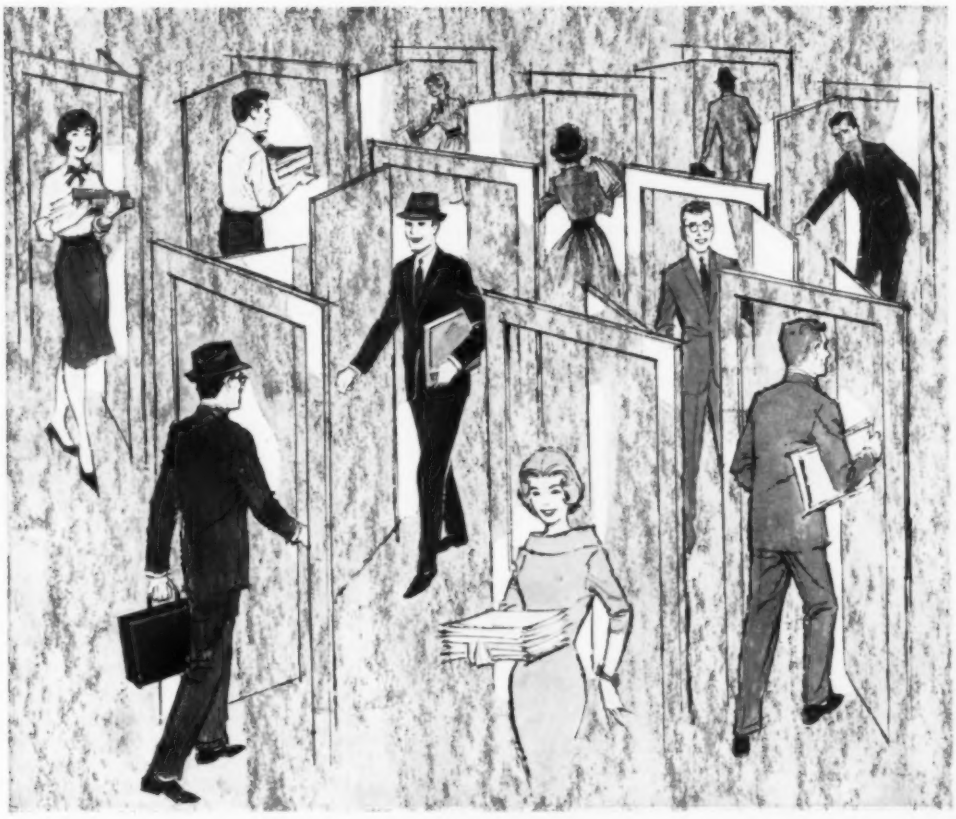
Burford on Metal Preparation

The March 9 meeting at Twin Ponds Country Club was opened by first vice president **Ted Duvall.** He congratulated the 19 members present for coming out on such a stormy evening.

It was the consensus of this Branch that the bylaws proposed for regional meetings should be changed, especially the sections dealing with Branch sponsorship of annual meetings. We prefer that each Branch assume full responsibility and by rotation.

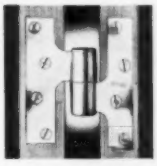
Librarian **Robert Krawczyk** introduced the speaker, **R. M. Burford** of Pennsalt Chemicals Corp. His topic was "Preparation of Metal for Plating."

Mr. Burford stated that four points to



Open Sesame

Tens of thousands of doors of every description, in many of the most distinguished homes, commercial and office buildings, are equipped with the famous hinges produced by The Stanley Works, New Britain, Conn. In fact, because they provide advanced styling and long-lasting beauty to what had always been considered "stock hardware", Stanley hinges are specified by knowledgeable architects and industrial designers the world over. The name Stanley has become a byword wherever hardware users want more than function alone.



STANLEY ADDS BEAUTY AND STYLE TO PROSAIC HARDWARE WITH THE HELP OF TEN-YEAR OLD MEAKER AUTOMATIC PLATER

To most people, a hinge is a piece of hardware on which doors or piano tops swing open and closed. Today's architects and industrial designers go beyond function alone when specifying hinges, however, for they must complement modern materials and sleek design elements.

With the help of a MEAKER AUTOMATIC PLATING MACHINE, Stanley Hardware Division produces a family of hinges with advanced styling and life-time attractive finishes, specified for distinguished buildings the world over.

According to Stanley management, their MEAKER "AUTOMATIC" has also helped expand markets by providing a variety of durable finishes unmatched by competitive manufacturers. Typical, is a new forged bronze paumelle hinge for flush interior doors, finished in beautiful satin chrome, to complement interior decor.

What's more, absolute minimum down time has been recorded since the MEAKER "AUTOMATIC" was installed *over ten years ago*. During this time, Stanley has also processed literally tons of chrome or nickel finished products of their hardware division, on their MEAKER.

To expand markets by getting the jump on competition, more and more progressive manufacturers are turning to MEAKER AUTOMATION ENGINEERS. Our catalog, WHEN TO AUTOMATE, gives valuable pointers for improving profits through automatic plating or metal finishing.

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SINCE MEAKER 1899

consider are 1) Basis Metal, 2) Soil, 3) How clean? 4) Treatment to follow.

The major problem in selecting cleaning compounds is complicated by the great variety of soils and condition of them.

He presented some excellent ideas on tank design to assist cleaning and to derive the greatest extended life of the compounds.

He then mentioned the main advantages and disadvantages of various systems of cleaning by A) Soak, B) Electroclean, C) Spray, D) Spray Gun, E) Emulsion types, and G) Mechanical.

Mr. Burford stated that it is true that most cleaners are compounded from a relatively few basic chemicals but the greatest difference in results obtained can be attributed to the approximately 1200 complex additives available to blend with these basic compounds. He cited the importance of good rinsing.

H. J. Crouse
Secretary-Treasurer

LIFT! HELP YOUR BRANCH ATTAIN ITS MEMBERSHIP EXPANSION GOAL

MONTREAL

Reisenburg Discusses Barrel Polishing

The February 20 meeting of the Montreal Branch was held at the Sheraton Mount Royal Hotel and was attended by 25 members and 1 guest.

The speaker for the evening was **Jack Reisenburg Sr.**, a senior member of the Montreal Branch. Mr. Reisenburg spoke on "New Methods of Barrel Polishing and Tumbling."

One new member was accepted.

During the meeting, **H. Wilson** volunteered to act as chairman for the Dinner Dance Committee and **S. Frost** agreed to act as co-chairman.

G. Katronge
Secretary

NEWARK

Shaw and Saubestre Present Papers; New Officers Nominated

Due to the absence of the president and both vice presidents, the librarian, **Cy LaManna** presided at the February meeting, which he called to order with about 80 members and guests present.

Three applications for membership were received. One new member was elected.

Fred Meyer, chairman of the nominating committee, proposed as the slate of new officers: For president, **Al Korbelak;** first vice president, **John Kosmos;** second vice president, Cy LaManna; secretary, **Don Foulke;** treasurer, **George Wagner;** librarian, **Gene Wagner;** sergeant-at-arms, **Mario DiChiara;** Board of Managers—**T. Austin, W. Grigat, F. Meyer, G. Reuter** and **G. Bittrich;** for Delegates: D. Foulke, **W. A. Wesley** and G. Wagner; for Alternate Delegates: W. Grigat, A. Korbelak and F. J. LaManna.

Cy LaManna stated that there were 30 registrants in the Electroplating Course and that a few more would be accepted up until next Tuesday.

Don Foulke reported progress for the 1963 Convention.

George Shaw was called upon for his Timely Topic "Ultrasonics in Plating." He discussed in general terms the use of ultrasonics both in cleaning and plating cycles and how far the art had advanced. The equipment has in the last three years, advanced greatly in size and efficiency; able to work at higher temperatures and transducers can be readily replaced and rebuilt resulting in greater savings. While much work remains to be done, the results are encouraging in both cleaning and plating cycles for specific purposes.

Dr. Edward Saubestre spoke on "Plating on Non-Metallics." He explained that electroless plating of plastics, ceramics, glass and semiconductors does present a problem in adhesion since the forces are weak. Mechanical keying must be obtained by either mechanical or chemical roughening after which the work is sensitized, activated and then electroless plated. He discussed, in general terms, cycles for cleaning and wetting various types of plastics, resins and rubbers. Silicones which are used for mold releases cause much of the wetting troubles and are best removed mechanically.

Dr. Saubestre stated that electroless plating is applied (about 40 per cent) on metallic surfaces because of its excellent "throwing power." He discussed in general terms how to electroless plate on all the metals. Active metals such as iron, nickel, cobalt, etc. are easily plated.

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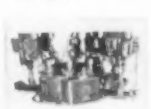
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Noble and passive metals are activated in fluoride baths. Metals such as bismuth, lead, zinc, etc., are first copper plated by conventional means prior to electroless plating.

Both speakers covered their subjects very well and created much interest as attested by the numerous questions.

Gustav Bittrich
Assistant Secretary

NEWARK

Research Fund Donation; Martini, Foulke, Petrocelli, Turner Speak

First Vice President **Al Korbelak** called the March meeting to order with about 85 members and guests present. Among the visitors were **Clarence Sample** and **Milton Nadel** of the New York Branch, and **Gil Stavri** and **John Noel** from Paris, France.

One application for membership was received and three members were elected.

Cy LaManna stated that the next meeting is Ladies Night and that we would have a mentalist to amuse us.

A motion was made, seconded and carried that the Secretary cast the vote electing the nominees of the February meeting as officers for 1961–1962. Milton Nadel installed the officers and wished them well.

Since Past President **John Banta** was absent, having been transferred to Chicago, he requested **Fred Meyer** to present the Past-President's report. **Don Foulke** will send the Past-President's pin to John Banta in Chicago.

A motion was made, seconded and carried that the Newark Branch donate $100 to the AES Research Fund. This was a fine gesture, particularly since this is Sustaining Members Night. Palumbo Bros., Inc., joined the ranks of Sustaining Members.

The librarian presented **Al Martini,** whose "Timely Topic" was "Practical Hints on Gold Plating". Mr. Martini stated that there were more than 15 gold plating processes. He covered the group by types, namely, cyanide, neutral and acid gold plating. He discussed the relative merits, advantages and disadvantages, trouble shooting, etc., of the various types. It was an excellent resume of gold plating for the limited time available.

Myron Diggin reported on the Research Project No. 15, outlining the accomplishments and work in progress. He credited this project with much to do with improved more durable coatings because an accelerated corrosion test is so necessary for the evaluation of new processes. He further pointed out that a half million dollars had gone in this study, but that the project bank account is about the same as the original Research Fund payment.

Don Foulke discussed Projects 12, 18, 19 and 20 and closed his talk by stating the Research Committee deeply appreciates the financial support of the Sustaining Members which makes possible the continuance of the program. That the program is a success is indicated by the fact that many of the results are now in use by industry.

Joseph Petrocelli spoke on the "Physical Metallurgy of Plated Coatings". He felt confident that upon studying nucleation and cracking patterns, that we would have a much better understanding of plated coatings.

Dennis Turner was asked to speak on the "Mechanism of Electrodeposition". This study is highly technical and difficult. However, he discussed present-day thinking and future thought and work on this matter.

Gustav Bittrich
Assistant Secretary

NEW YORK

Members Discuss How to Make Meetings More Interesting

President **Rembecki** called the February 24 meeting to order.

A motion was made and carried that three applications for membership follow regular course.

It was decided to allot $150 for "Old Timers Night", to be held in conjunction with installation of officers on Friday, April 14. President Rembecki appointed **Isidore Friedman** chairman of "Old Timers Night" committee.

Milton Nadel and **Angelo Amatore** received a rising vote of thanks for the good job done when banquet was cancelled due to the snow storm. They managed to make arrangements for a new date very quickly without any loss to the Branch treasury.

The president thanked all banquet committees for a job well done.

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Librarian **Martin Pollack** made the following suggestion to make the meetings more interesting: An employment service, a monthly publication and more question-and-answer sessions. These suggestions started the members going and we had a really interesting meeting, with most of the members present taking an active part.

Fred Saras
Recording Secretary

PHILADELPHIA
Pinner Speaker at Sustaining Member Night

The regular meeting of the Branch was held on March 27 at Beck's on the Boulevard Restaurant. Forty-seven were at dinner and the meeting was called to order at 8:15 by Branch President **Cogan** with about 65 in attendance.

This being Sustaining Members Night, Mr. Cogan welcomed them; the names of the Sustaining Members in the Philadelphia area were read and their representatives present arose and were acknowledged.

The secretary read the minutes of the regular and executive group meetings held on January 23, which were approved. Treasurer **Ross** gave his report. The secretary gave the interim financial report of the 1961 Banquet and Educational Session. Second Vice President **Berenato** reported Beck's Restaurant had been reserved for regular meetings through December 1961. He urged everyone intending to have dinner at the restaurant before the meetings to send in the reservation card accompanying the meeting notice. For the present meeting only 24 reservations were received and 47 were at dinner.

Mr. Cogan announced a reservation confirmation from The Benjamin Franklin had been received for the 1962 Educational Session and Banquet to be held there on March 2 and 3. A motion was passed that this place and dates be accepted.

An amended motion was passed to appoint a committee to check into the date and place for this year's Ladies Night and report at the next meeting.

Welfare Chairman **Vincent Casswell** reported that members **Paul Mentzer Sr.** and **Francis Perazza** were in the hospital and member **Benjamin Barnes** had passed away.

The speaker was **Walter L. Pinner,** manager of plating development, McGean Chemical Co., AES National Past President and Project No. 15 Committee Chairman, whose topic was "Accelerated Corrosion Tests for the Performance of Plated Coatings."

Mr. Pinner's talk was a report on the historical background and development of the Corrodkote and CASS tests, the formulas and operating specifications of the tests, the present and future phases of the tests and Project No. 15 and a summary of data correlating the tests to actual exposure in service performance. These data showed the high rate of correlation that has led to the adoption of the tests by the automotive industry as standard accelerated tests for specifying coating performance. Mr. Pinner stated his paper was to be given at the forthcoming AES National Convention in Boston.

The meeting adjourned at 9:55.

I. Wm. Marcovitch
Secretary

PHOENIX
Second Annual Metal Finishing Symposium

The Phoenix Branch sponsored the Second Annual Metal Finishing Symposium at Arizona State University on March 25.

A most interesting and varied series of subjects were presented relative to metal finishing. The schedule of talks was as follows:

"Copper Plating from Cyanide Baths," Elburn Marcum, electrochemicals department, E. I. duPont de Nemours & Co., Los Angeles; "Some Aspects of Air-Agitated Nickel Plating," William Lidtke, Butcher Co., Los Angeles; "Chromium Plating Up-To-Date," Gene Combs, Diamond Alkali Co., Cleveland; "Defining and Establishing Metal Finishing Quality Standards," E. E. Kirsch, computer department, General Electric Co., Phoenix; "Costing and Pricing Metal Finishing Production Jobs," Willard Bell, Chemresearch Co., Phoenix and Los Angeles; "Control of Metal Finishing Quality," Jack Beall, Crown Chemical and Engineering Co., Los Angeles.

General Chairman **Robert Hays** and all concerned are to be congratulated for the successful event.

Paul M. Wible

ULTRASONIC CLEANING
CUTS REJECTS TO LESS THAN ¼%

A rack of precision reflectors is removed from a side-mounted ultrasonic tank at the Foremost Manufacturing Co.

Mr. Herb Schiller of Foremost Manufacturing Co., Maplewood, N. J., manufacturers of precision metal reflectors states: "Since we installed Branson ultrasonic cleaning equipment our rejects have been reduced from 8% to less than ¼%. Our ultrasonic cleaning equipment is extremely reliable. Branson's excellent service has certainly helped to make our operation even more efficient."

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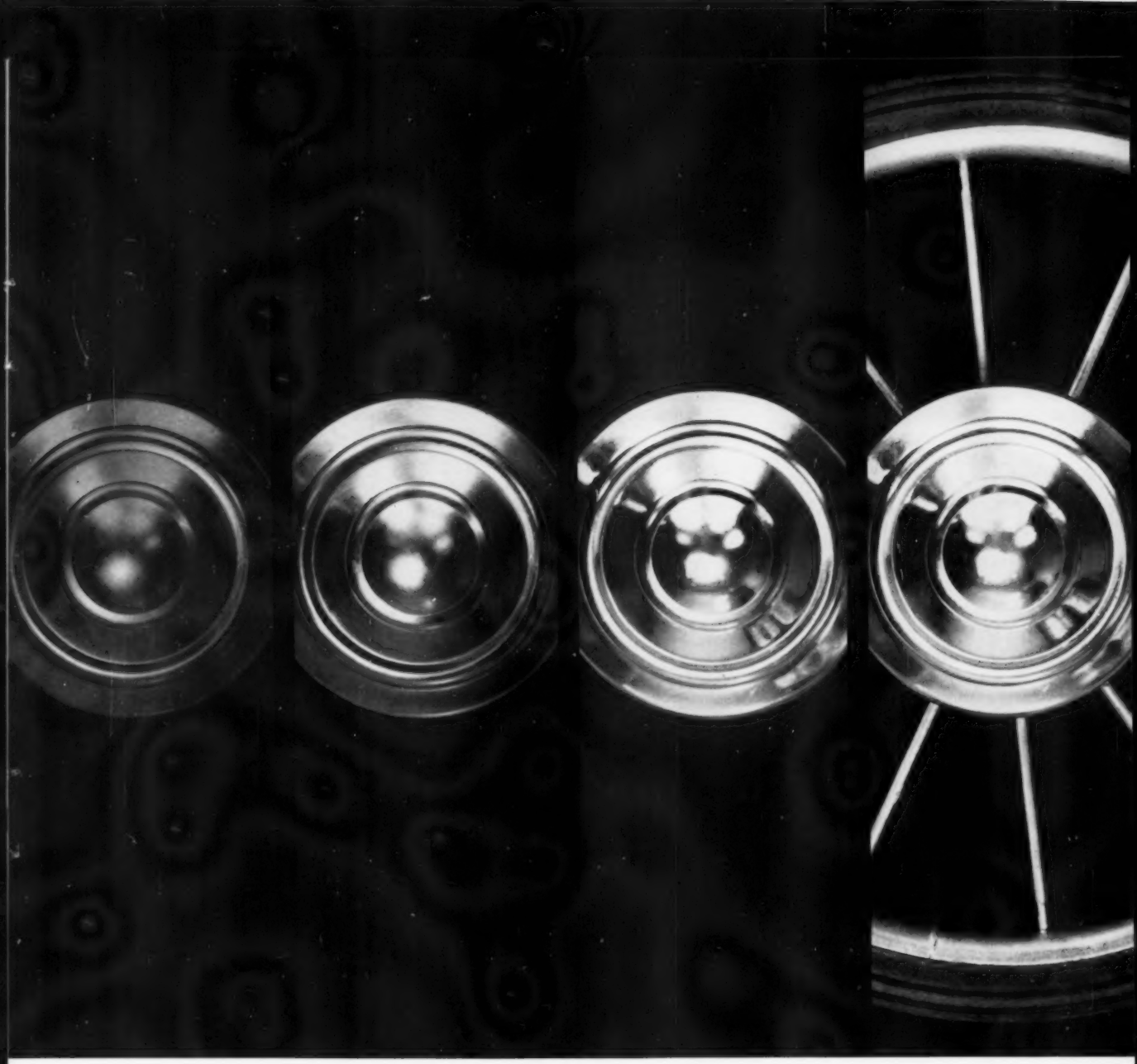

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Here's how to bring out all the brilliance that zinc can reflect when plated on a smooth-surfaced product. Two simple procedures do it. First, be sure to plate in a zinc bath to which you've added the new M&T ZINC BRIGHTENER 25. After plating, produce chromium-like appearance with a quick chromate treatment in UNICHROME CLEAR DIP.

A stable and concentrated liquid, the new brightener comes ready for immediate pouring. Its use assures coverage and a uniformly bright plate even in low current-density recesses. It works equally well in barrel, still or automatic plating...gives economical "mileage" with consistent results.

Unichrome Clear Dip adds remarkable durability to zinc plate at low material cost. It protects against "white rust," satisfies the corrosion-resistance specifications for chromate finishes. While the brightener brings out the brilliance you want, Unichrome Dip helps "permanize" it ...and primes it for a top coat of Unichrome Clear Enamel when you want a product finish of truly superior quality.

Send for more data on M&T's complete line of supplies and processes to improve the economy of zinc finishing operations and the quality of the finish.

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PITTSBURGH

Mitwol Discusses Rectifiers; Forbes Heads New Officers

The following officers were elected for the year of 1961–1962 at the regular monthly meeting held on March 8: President, **C. A. Forbes;** first vice president, **E. B. Keller;** second vice president, **E. L. Kost;** librarian, **W. R. Johnson;** secretary, **C. A. Mungall;** treasurer, **R. P. Cope Jr.;** Delegates, **W. F. Pizoli, Myron Ceresa, L. E. Laney;** Alternates, **J. R. Crain, R. J. Goldbach, E. J. Smith.**

A new member was elected.

The technical paper was presented by **S. Mitwol** of Sel-Rex Corporation who discussed "Rectifiers."

The April 12 meeting will be a joint meeting with the Electrochemical Society. The guest speaker will be **Dr. Charles L. Faust.**

Clyde A. Mungall
Secretary

ROCHESTER

Arndt Talks About Ventilation Equipment

The March 6 meeting of the Rochester Branch was called to order by President **John Cipolla.**

Several reports were given on the Rochester Branch's 50th Anniversary Celebration combined with the 7th Annual Empire State Regional Meeting to be held at the Manger Hotel on May 5 and 6. According to all reports, this should be a great success and a good time should be had by all who attend.

After the business meeting, Librarian **Loring F. Carson** introduced the speaker, **F. W. Arndt,** chief engineer of the Heil Process Equipment Corp. His topic "Corrosive Fume Ventilation Equipment" was very complete and informative. Mr. Arndt illustrated his talk with several slides and added just enough humor to hold the attention of all present.

Peter VanDilst
Secretary

SAGINAW VALLEY

Linford Discusses Effect of Soils

The worst day of the winter did not deter 40 hardy members from attending the monthly meeting, held at Zehnder's Hotel, Frankenmuth, on Wednesday, March 8 to hear **Dr. Henry B. Linford** of Columbia University speak on "The Effect of Soils on the Adhesion of Electrodeposits."

A most interesting and enlightening discussion, preceded by our usual social hour in the taproom of Zehnders and a good chicken dinner. The paper was followed by a short business session, during which time it was agreed that this Branch would go through the process of incorporation. We also agreed to make the usual donation to the Bay County Science Fair and to participate in a technical symposium to be held at Flint Junior College on May 24 and 25.

The results of the election were announced. The officers elected are: President, **Frank Reha; G. L. Gutscher, Jr.,** first vice president; **L. Mangett,** second vice president; **Pat Kehoe,** secretary-treasurer; **R. Peterman,** recording secretary; **W. Ross Jr.,** librarian; **J. Reed, R. Stork, A. Muehlenbeck,** two year terms, board of managers.

Two new members were elected.

SAN DIEGO

Printed Circuits Discussed by Babcock and Weekly

President **Harry Steinke** opened the February 7 meeting at 8:50 p.m. at Calabrese's Restaurant. Forty-six members and guests were in attendance.

Three applicants were introduced by **George Loch** and voted into membership.

George Loch, vice president and educational chairman, introduced **Emmett Babcock,** supervisor, Process Control Laboratories, Convair-Pomona, and **Claude Weekly,** sales engineer, McDermid Pacific Corp., Los Angeles, speaking on "Plating on Printed Circuits." Emmett spoke on the base materials

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Practical Products

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SEELEY BUFFING COMPOUNDS

Help Identify Your Products
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Burring—Polishing—Buffing
Compounds
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For Satin & High Lustre
Metal Finishing

E. E. Seeley Co., Inc. Bridgeport, Conn.

(boards), what they were made of, their physical, chemical and electrical properties and how these properties might affect further processing of the boards as well as their use in electronic systems. Claude discussed the chemical processing of circuit boards, i.e., the cleaning and plating of the board to make it useful in the electrical circuits for which it is designed. Discussed were the types of cleaning processes used at various stages of processing and various plating baths used to plate the boards for specific requirements. A lively question and answer session followed the formal presentation.

Walter J. Dornbusch Jr.
Secretary

SAN DIEGO

Squitero Talks on Plating Hard to Plate Metals

President **Harry Steinke** presided at the March 7 meeting at Calabrese's Restaurant which was attended by 28 members and guests.

George Loch presented three applicants for membership. Their applications were approved. Mr. Loch presented **A. D. Squitero** of the International Nickel Company, Development and Research Division, New York, N. Y. who gave a presentation on "Plating on Difficult to Plate Metals" as the educational program for the evening. Mr. Squitero discussed the three methods of metal preparation prior to plating, (1) alkaline, solvent or emulsion cleaning. (2) pickling, acid etching and (3) electrolytic cleaning. Further discussion included metal preparation and preplating of aluminum, magnesium, molybdenum, zirconium, tungsten, vanadium, uranium, fuel elements and beryllium. Appropriate step-by-step treatments were described.

Walter J. Dornbusch Jr.
Secretary

SOUTHEASTERN

Double Feature at Atlanta Attracts Largest Attendance

The Southeastern Branch held its regular monthly meeting on March 10 at the Pig-N-Whistle in Atlanta, 43 members and guest attending. **Bruce Taylor** presided. The attendance was one of the largest recorded for a regular monthly meeting. **H. R. Stogner** reported the success of the 3rd Dixie Regional meeting and **Clem Hohner,** National Committee Chairman for 1966, announced the selection of the Fontainebleau Hotel, Miami Beach, as the convention site.

PLATING MAGAZINE invites AES Branches to furnish news for publication in PLATING concerning electroplating courses sponsored.

E. L. Gabel of Allied Research Products, Inc. presented a detailed talk on the variables in cyanide zinc plating, illustrating with projected slides. **Robert E. Gueder** also of Allied Research briefly reminisced on the evolution of the art/-science of electroplating.

H. R. Stogner
Secretary

SPRINGFIELD

Blount Honored with Plaque: New Officers Elected

The Springfield Branch met at Wayside Restaurant on Monday evening, March 27 for the regular monthly meeting. Due to the special program that had been planned, the business part of the meeting was scaled down to the minimum.

The Branch secretary thanked all of the members and friends who had so thoughtfully sent cards, brought magazines and gifts and visited him both at the hospital and at home, and for the beautiful set of glassware, and all the other gestures of kindness, which are so deeply appreciated, when a person is disabled.

The secretary announced from the minutes of the last month's meeting, that a nominating committee had been appointed, and a slate of officers would be presented for the election to be held at this meeting. Chairman **Charles F. Griffin Jr.** said after due consideration by **Ed-**

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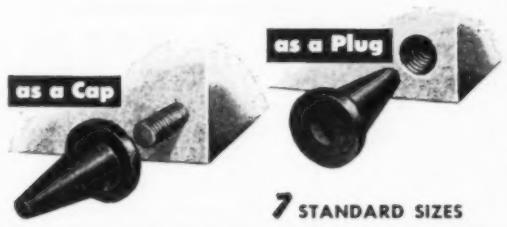

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TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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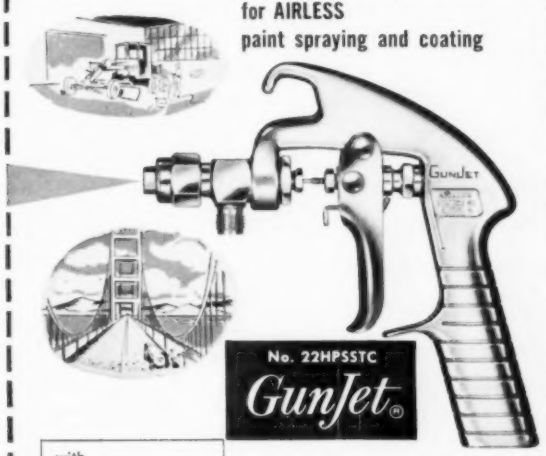

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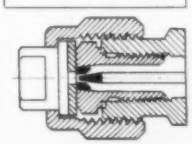

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ward F. Koetsch Jr., Wayne B. Sanders and himself, the following nominees were offered for consideration: President, **Louis E. Dupuis;** first vice president, **Ernest P. Donaruma;** second vice president, **Leo J. Diamond;** secretary, **Henry L. Heissfeld;** treasurer, **George H. Mongeau;** librarian, **Paul R. Lane.** For the Board of Managers, the following names were offered: **Elery C. Gibson, Robert J. Girard, William J. Grover Jr., Richard J. Hieronymus** and **Alexander R. Salmond.** Following some general discussion, a motion was made to close the nominations. The Branch secretary was instructed to cast one vote to elect the slate of officers as presented. A motion was placed on the floor and carried to suspend the rules and install the officers at the annual outing and banquet, to be held on June 10.

The balance of the program was turned over to Robert J. Girard, acting as technical chairman for the evening.

Bob went into a rather lengthy discourse on the background of the speaker, not only from a technical and business point of view, but as a friend of the Springfield Branch, and several of its members. Bob stressed the various activities in and for the AES, as well as closely allied agencies, in which this man was engaged, and felt that some sort of recognition should be shown him.

At this point, President Salmond interrupted, and announced that the members of the Springfield Branch felt just that way. After a very short introduction, he presented a walnut and, suitably engraved metal plaque, as follows:

TO
EZRA A. BLOUNT

In Recognition for His Many Contributions in the Dissemination of Technical Knowledge and for His Untiring Efforts in Continually Promoting the Objectives of the Society.

From the Members
of the Springfield Branch
American Electroplaters' Society
27 March 1961

After the initial shock of overwhelming surprise, Ezra thanked the group, and then proceeded to his talk, "Factors Affecting Job Plating Costs." The topic was very well covered, considering the time allotted had to be cut almost in half, so that the many members and guests would also be able to enjoy a review of Ezra Blount's recent trip to Japan, along with the beautiful colored movies and the information given on the plating industry and conditions in general in Japan, Hong Kong, Formosa, etc. A number of pamphlets and advertisements both in Japanese and English were available for inspection.

All in all, this meeting night will live long in the memory of the members and guests who were there to enjoy it. Part of the program was very educational and the balance, too, was educational as well as entertaining. Of course, those who stayed home will never realize just how much they missed.

Henry L. Heissfeld
Secretary

ST. LOUIS
Tour Plant of Cupples Products

The February meeting was cancelled due to a heavy snow fall.

The March 7 meeting was a tour of the Cupples Products Corp. plant. The tour started at 5:30 with approximately 90 people present. The tour was arranged by Librarian **G. K. Robins,** through the cooperation of **Milton Lief,** vice president of Cupples.

Cupples Products specializes in aluminum windows and curtain wall building shapes. The guided tour started in the new 140,000 sq ft addition just finished and went through the press area, the remelt area, the storage area, the anodizing and hard coating departments.

It was a very interesting tour and we want to thank Mr. Lief for the privilege of seeing the operation.

Ward Kelly
Secretary

SYRACUSE
Alderuccio Talks on Surface Preparation after Solvay Plant Tour

The February meeting consisted of a plant tour of The Solvay Process Company's Caustic Plant. This was followed by a fine dinner served in Solvay's cafeteria to 32 members.

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The meeting was called to order at 7 p.m. in the Solvay Auditorium. The speaker of the evening was **Lee Alderuccio** of the Solvay Research Group, studying chromium plating problems. Mr. Alderuccio's subject was, "The Adhesion of Chromium Plating as Affected by Surface Preparation."

René Sonnenfeldt
Recording Secretary

TORONTO

Bellinger Addresses Branch; Preparations for Symposium Announced

A report outlining the final arrangements for the first Metal Finishing Symposium ever held by the Toronto Branch was a highlight of our general meeting February 10 in the Algonquin Room of the Royal York Hotel.

Ray Day, reporting for the Symposium Committee, stated publicity for the event would be widespread including mailings of thousands of letters to industry in general plus articles which will be appearing in trade journals. He urged all members of the Branch to turn "salesmen" for the event and sell the symposium's product—Knowledge.

Top speakers will provide a rich program for this event which is being held March 28 in the Seaway Hotel in Toronto.

Kenneth Bellinger of Conversion Chemicals, was the speaker of the evening.

Another first for the Branch, a Ladies Nite, to be held in the King Edward Hotel, May 6, will see the members entertained lavishly by television and nite club stars.

Brock Laws

WESTERN ONTARIO

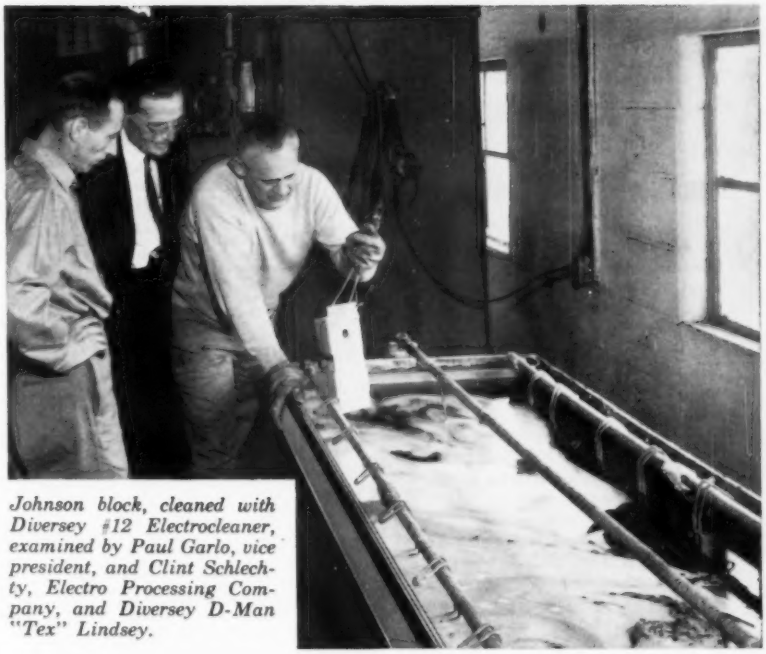
Davidson Explains Barrel and Spin Finishing

The regular meeting was held in the Wm. Pitt Hotel, Chatham with 18 members and guests present. The members showed keen interest in the symposium being held by the Toronto Branch, March 28, with many planning to attend.

Don Berry introduced the speaker of the evening **R. T. Davidson** of Grav-i-flo Corporation, Sturgis, Michigan. Mr. Davidson gave a very interesting talk on barrel and spin finishing. The spin finishing proved very interesting to the Branch in view of the increasing costs of buffing. After Mr. Davidson's talk he displayed sample parts and explained the different processes used on each. He also showed a short film which helped bring out many questions.

Leo Crooks thanked the speaker for his fine talk.

Bob Dobson
Vice President



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IMPORTANT TO AES BRANCHES AND BRANCH SECRETARIES

1. A Return Sheet listing your Branch's accredited Delegates and Alternate Delegates has or will soon reach you. Via that Return Sheet, you are expected to specify those accredited Delegates and/or Alternate Delegates of your Branch who will be at the Boston Convention to represent it officially in the deliberations of the Supreme Society at its June 19 plenary session and its June 22 executive session. If none of your own Delegates or Alternates definitely intend to attend the Convention, you may select and specify three acceptable choices, in order of preference, from among other of the AES's 59 chartered Branches, thus enabling the Credentials Committee to assign your Branch's proxy to the available one so that it can exercise your franchise in your Branch's behalf. Your Return Sheet to be acceptable *must* be signed by both your Branch's President and Secretary, and should properly reach National Headquarters on or before specified deadline. *References:* AES Constitution, Part I, Article III, Sections 1 and 2, and Bylaws, Part II, Art. VII, Section 1.)
2. A complete certified roster of your Branch Members in good standing as at June 30, 1961 must, by AES Bylaw provision, be in the hands of the National Executive Secretary on or before July 15, 1961. That list should include every member for whom your Branch paid Per Capita Tax in the July 1, 1960-June 30, 1961 fiscal year, including all new members, all reinstated members and all members "transferred in" during that period, minus all suspended, all resigned, all died or all "transferred out" members from July 1, 1960 through June 30, 1961. Upon arrival of your Branch list and its reconciliation with National Headquarter's records, your Branch will then promptly be billed by National Headquarters for Per Capita Tax for the fiscal year July 1, 1961-June 30, 1962 (*References*: AES Bylaws: Part I, Article V, Section 3, and Part II, Article V, Sections 4 and 5.)

ELECTROPLATING COURSES

BROOKLYN, N. Y.—Ft. Greene Evening High School
Louis Serota, Instructor
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CHICAGO, ILL.—Illinois Institute of Technology
J. M. Andrus, Instructor
18-wk. course—Fee: $80

CLEVELAND, OHIO—Max S. Hayes Trade School
H. Pochapsky Instructor
15-wk. course—Fee: $11

INDIANAPOLIS, IND.—Purdue University Extension
Dr. A. M. Max, Instructor
16-wk. course—Fee: $45

MONTREAL, QUE.—Polytechnique Institute
Dr. Andre Hone, Instructor
3-year course—Fee: $50

NEWARK, N. J.—Plants and Laboratories in Area
F. J. LaManna, Instructor
Allegri Tech, Inc., 141 River Rd., Nutley 10, N. J.
14-wk. course—Fee: $25

NEW HAVEN, CONN.—New Haven College
L. J. Durney, Instructor
15-wk. course—Fee: $50

PHILADELPHIA, PA.—Temple University Technical Institute
Dr. S. Heiman, Instructor
4 Semesters, each 16 wks.—Fee: $37 per Sem.

PORTLAND, OREGON—Portland State College
Dr. J. R. Mickelsen, Instructor
10-wk. course —Fee: $10

PROVIDENCE, R. I.—Central Senior High School
Omer Jette, J. Fogarty, J.Castriotta Instructors
2-year course—Fee: None

ST. LOUIS, MO.—Hadley Technical H. S.
Dr. Otto C. Klein, Instructor
16-wk. course—Fee: $10

SAN ANTONIO, TEX.—Trinity University
W. P. Wisdom, Instructor
18-wk. course—Fee: $10

SAN FRANCISCO, CAL.—Cubberly H. S., Palo Alto
William Ferry, Instructor
24-wk. course—Fee: $3 per 12wk semester

SOUTH BEND, IND.
Dr. H. J. Wiesner, Instructor

SPRINGFIELD, MASS.—Chicopee Vocational H. S.
R. J. Girard and E. F. Koetsch Jr., Instructors
Two 12-wk. courses—Fee: None

TORONTO, ONT.—Central Technical High School
R. H. Clark, Instructor
22-wk. course—Fee: $15—non-res.
$ 5—city res.

VANCOUVER, B. C.—Vancouver Technical School
Walter Kellerman, Instructor
6-mo. course—Fee: $15

BLACKSBURG, VIRGINIA—Virginia Polytech Inst.
Professor Nelson F. Murphy, In Charge
Short course—Aug. 20 to Sept. 1, 1961—Fee $25

EVANSVILLE, IND.—Joseph B. Kushner Electroplating School
Joseph B. Kushner, Instructor, 621 S. Norman Ave.
4 mos. to 1 yr. correspondence courses—Fee: $150

SANTE FE SPRINGS, CAL.—Weiner Electroplating School
Milton Weiner, Instructor, 12631 Imperial Highway
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The above listings were correct so far as could be ascertained at press time. Prospective students are urged to verify courses and fees prior to making definite plans.

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Blue Ridge: W. P. Conine, M. W. Courvoisier, D. B. Wyche, J. P. McSwain, S. M. Proco, L. B. Holt, D. J. Fineberg

British Columbia: J. D. Reaich

Cincinnati: N. Rose

Cleveland: M. A. McGinnis, C. M. Varga, W. H. West, C. C. MacCrindle, R. E. Stephenson

Dayton: G. W. Lawless

Denver: R. Robbins, K. A. Denison

Detroit: S. H. Bruce, R. A. Trudell, C. T. Fuller

Grand Rapids: W. E. Daugherty Jr., P. F. Vadeboncoeur, W. F. Alandt, R. Baker

Hartford: E. D. Kane, D. J. Baron, F. X. Strelchun, P. Wilson, L. J. Jennings

Houston: D. G. Eckholm

Lancaster: J. B. Hoffert

Los Angeles: G. Warneck, R. C Colonel, R. W. Schimming

Milwaukee: W. Dohse, R. J. Walters

Newark: R. E. Krueger, J. Tomko, G. M. Vingara

Phoenix: J. Meng Jr.

Pittsburgh: J. F. Garland

Rochester: T. A Welch, H B. Drysdale

St. Louis: S. Ponticello, F. E. Ward, T. W. Wodraska

San Diego: R. I. Emilio, W. H. Coppage, K. T. Oswald, J. S. Clines, W. D. Davis, S. Witkoff

Southern Tier: J. J. Hennessey

Springfield: G. L. Bach

REINSTATEMENTS

British Columbia: J. Stoneberg

Cleveland: A. Singleton

Dayton: A. Watson

Hartford: G. Vibberts, J. Pepe, P. Rogers, L. Kosowsky

Houston: J. P. Morman

Mississippi Valley: S. Neilson

Newark: P. Vitarelli, M. Salvaggio

Member-at-Large: V. M. Grau

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Milwaukee: W. H. Duckworth to Indianapolis

Mohawk Valley: W. H. Walczyk to Los Angeles

New Haven: C. A. Kuster to San Francisco

San Diego: J. Tulumello from Seattle-Puget Sound

Southeastern: A. E. Olsen from Detroit

RESIGNATIONS

Denver: O. T. Towner

Hartford: K. W. Joseph

SUSPENSIONS

Grand Rapids: J. R. Kuiper

Hartford: W. G. Brown, S. F. Sikorski

DEATHS

Cleveland: W. D. Scott

Los Angeles: K L. Thompson

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PLATING MAGAZINE

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Any such paper accepted and published in PLATING will also be eligible for selection by the Society's Paper Awards Committee for the Carl E. Heussner AES Gold Medal Award; AES Silver Medal; AES Bronze Medal; George B. Hogaboom Memorial Nickel Plating Award; Robert S. Leather Mechanical Finishing Award; Chromium Plating Award; Precious Metal Plating Award of AES; John J. Hanney Memorial Copper Plating Award; Organic Finishing Award; Zinc Plating Award and the Aluminum Finishing Award of AES.

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YOUR PLATING MAGAZINE QUESTIONNAIRE

So as to assure that PLATING MAGAZINE's classification of its subscribers by number, function and geographical location is constantly and consistently up to date for Audit Bureau of Circulations audit, a Return Sheet was recently issued to each subscriber internationally. It is revealing that nearly 50 per cent of such Return Sheets issued were executed and returned by subscribers within ten days of issuance, with the flow, of course, continuing. If you have not yet accomplished and returned yours, your cooperation in doing so promptly will be appreciated by AES and PLATING.

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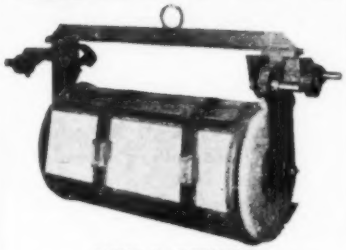

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May 2,	1961—**Central Michigan Branch Annual Educational Session and Banquet,** Hotel Hayes, Jackson, Michigan.
May 5-6,	1961—**Rochester Branch Fiftieth Anniversary Celebration Concurrently with Empire State Regional Annual Meeting,** Hotel Manger, Rochester, N. Y.
May 6,	1961—**St. Louis Branch,** Annual Banquet, Sheraton-Jefferson Hotel, St. Louis, Mo.
May 6,	1961—**Toronto Branch,** Ladies Night, King Edward Hotel, Toronto, Canada.
May 20,	1961—**San Diego Branch Installation Meeting,** Hotel Coronado, Coronado, Calif.
June 10,	1961—**Pittsburgh Branch,** Ladies' Night Dinner Dance, Churchill Valley Country Club.
June 10,	1961—**Springfield Branch,** Annual Golf Outing, Installation of Officers and Banquet, Whippernon Club, Russell, Mass.
June 18-23,	1961—**48th AES Annual Convention,** Hotel Statler, Boston, Mass.
July 22,	1961—**Detroit Branch Annual Stag Day,** Glen Oaks Country Club, Farmington, Mich.
Dec. 15-16,	1961—**Newark Branch Annual Educational Session and Banquet,** Robert Treat Hotel, Newark, N. J.
January 13,	1962—**Ninth Interim Meeting, Supreme Society,** Hotel Marott, Indianapolis, Ind.
January 20,	1962—**Grand Rapids Branch Annual Meeting,** Pantlind Hotel, Grand Rapids, Mich.
February 9-10,	1962—**Fourth Annual Dixie Regional Educational Meeting,** Dinkler-Plaza Hotel, Atlanta, Georgia
March 2-3,	1962—**Philadelphia Branch Annual Educational Session and Banquet,** Benjamin Franklin Hotel, Philadelphia, Pa.
April 21,	1962—**23rd Annual New England Regional Meeting,** Hotel Statler, Hartford, Conn., Springfield Branch, Host.
June 25-28,	1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.
June 24-27,	1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.

June 15-18, 1964—51st AES Annual Convention, Sheraton-Jefferson Hotel, St. Louis, Missouri.

June 16-18, 1964—Sixth Industrial Finishing Exposition, St. Louis, Missouri.

June 28-July 1, 1965—52nd AES Annual Convention, Statler Hotel, New York, N. Y.

June 26-30, 1966—53rd AES Annual Convention, Hotel Fontainebleau, Miami, Florida. Dixie Regional Council, Sponsor. Southeastern Branch, Host.

INTERSOCIETY

May 2-4, 1961—16th Purdue Industrial Waste Conference, Purdue Memorial Center, Purdue University, Lafayette, Ind.

May 22-26, 1961—American Society of Tool and Manufacturing Engineers, Engineering Conference and Exhibit, New York, N. Y.

May 27, 1961—Masters' Electro-Plating Association, 43rd Annual Banquet, The Plaza Hotel, New York, N. Y.

June 16-19, 1961—National Association of Metal Finishers, Annual Convention, Statler-Hilton Hotel, Boston, Mass.

June 18, 1961—Metal Finishing Suppliers' Association, Board of Trustees Meeting, Statler-Hilton Hotel, Boston, Mass.

June 19, 1961—Metal Finishing Suppliers' Association, Annual Luncheon and Meeting, Statler-Hilton, Boston, Mass.

June 25-30, 1961—American Society for Testing Materials, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 26-27, 1961—American Vacuum Society, 5th Annual Conference on Vacuum Metallurgy, co-sponsored by New York University, at University Heights Campus of N. Y. U.

July 31-Aug. 4, 1961—Gordon Research Conference on Electrodeposition, Tilton School, Tilton, N. H.

October 1-5, 1961—The Electrochemical Society, Fall Meeting, Hotel Statler, Detroit, Mich.

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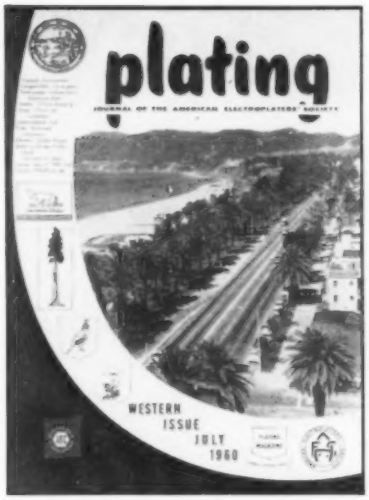

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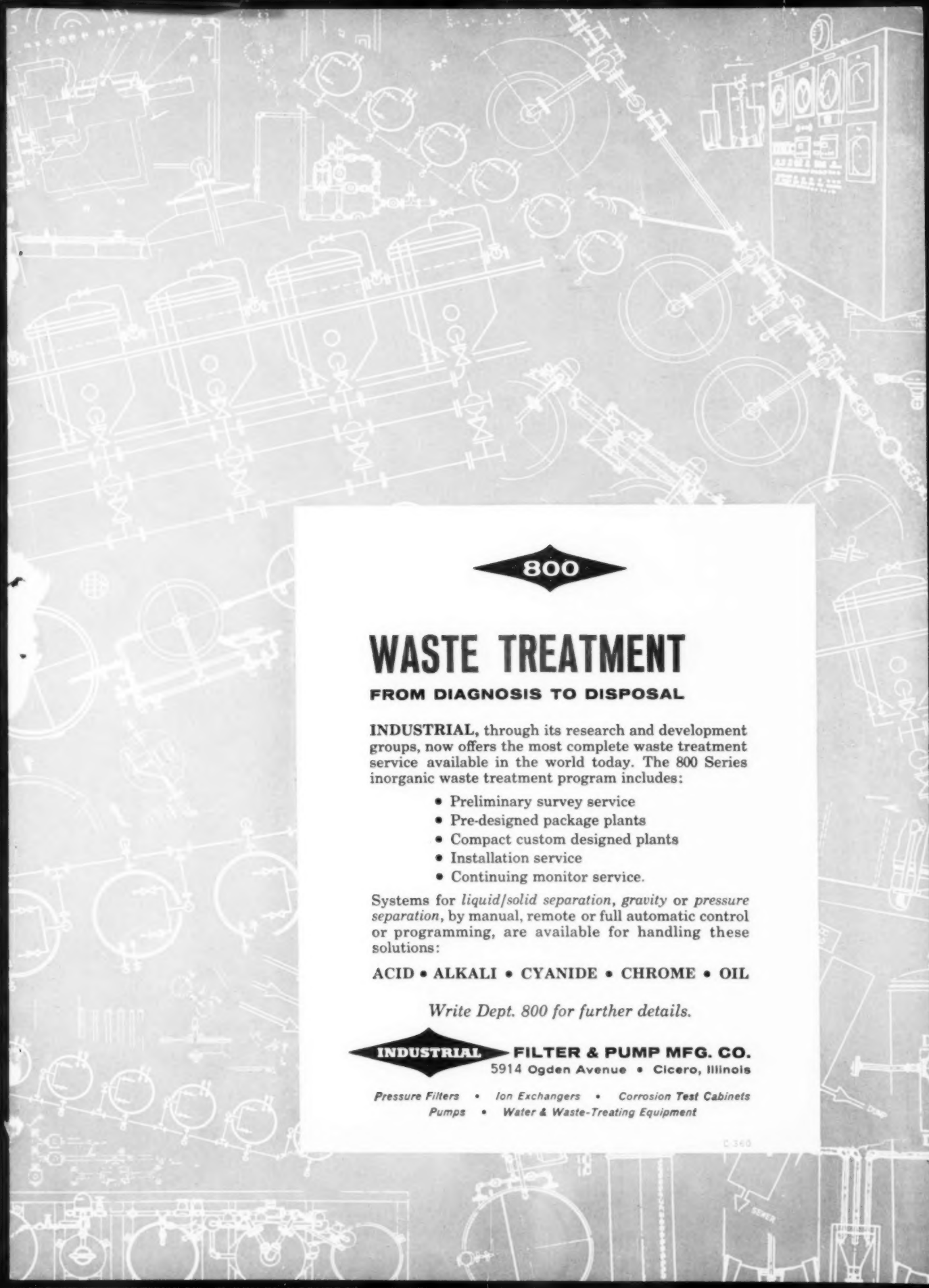

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